STATISTICAL DATA OF THE ELECTRIC LIGHT AND POWER INDUSTRY

Compiled Monthly by the Edison Electric Institute—Covers 100% of the Industry

DURING THE MONTH OF JUNE

	1934	1933	%
Kilowatt-hours Generated* (net)			
By fuel	4,494,132,000	3,948,024,000	+13.8
By Water Power	2,441,973,000	2,741,138,000	−10.9
Total Kilowatt-hours generated	6,936,105,000	6,689,162,000	+ 3.7
Additions to Supply			
Energy purchased from other sources	192,382,000	224,760,000	−14.4
Net International Imports	83,953,000	44,156,000	+90.1
Total	276,335,000	268,916,000	+ 2.8
Deductions from Supply			
Energy used in electric railways departments	47,546,000	50,036,000	− 5.0
Energy used in electric and other departments	108,778,000	98,602,000	+10.3
Total	156,324,000	148,638,000	+ 5.2
Total Energy for Distribution	**7,056,116,000**	**6,809,440,000**	**+ 3.6**
Energy Lost in Transmission, Distribution, etc.	**1,173,922,000**	**1,206,025,000**	**− 2.7**
Kilowatt-hours Sold to Ultimate Consumers	**5,882,194,000**	**5,603,415,000**	**+ 5.0**
Sales to Ultimate Consumers (kw-hrs)			
Domestic Service	972,929,000	888,701,000	+ 9.5
Commercial—Small Light and Power (Retail)	1,049,281,000	997,258,000	+ 5.2
Commercial—Large Light and Power (Wholesale)	3,273,239,000	3,159,186,000	+ 3.6
Municipal Street Lighting	143,849,000	142,890,000	+ 0.7
Railroads—Street and Interurban	337,942,000	304,485,000	+11.0
Railroads—Electrified Steam	54,847,000	54,374,000	+ 0.9
Municipal and Miscellaneous	50,107,000	56,521,000	−11.3
Total Sales to Ultimate Consumers	5,882,194,000	5,603,415,000	+ 5.0
Total Revenue from Ultimate Consumers	$147,337,000	$143,367,600	+ 2.8

DURING TWELVE MONTHS ENDING JUNE 30th

Kilowatt-hours Generated* (net)			
By Fuel	52,064,368,000	44,413,170,000	+17.2
By Water Power	30,900,269,000	31,280,359,000	− 1.2
Total Kilowatt-hours Generated	82,964,637,000	75,693,529,000	+ 9.6
Purchased Energy (net)	3,374,271,000	2,654,485,000	+27.1
Energy Used in Electric Railway and Other Departments	1,972,816,000	1,961,924,000	+ 0.6
Total Energy for Distribution	84,366,092,000	76,386,090,000	+10.4
Energy Lost in Transmission, Distribution, etc.	**14,603,893,000**	**13,934,118,000**	**+ 4.8**
Kilowatt-hours Sold to Ultimate Consumers	**69,762,199,000**	**62,451,972,000**	**+11.7**
Total Revenue from Ultimate Consumers	$1,805,625,500	$1,772,767,900	+ 1.9
Important Factors			
Percent of energy generated by waterpower	37.2%	41.3%	
Average pounds of coal per kilowatt-hour	1.45#	1.46#	
Domestic Service (Residential Use)			
Average Annual Consumption per Customer (kw-hr)	614	598	+ 2.7
Average Revenue per Kw-hr (Cents)	5.39¢	5.56¢	− 3.1
Average Monthly Bill per Domestic Customer	$2.76	$2.77	− 0.4

BASIC INFORMATION AS OF JUNE 30th

Generating Capacity (kw)—Steam	23,927,400	24,026,200	
—Water Power	9,006,500	8,977,200	
—Internal Combustion	470,400	461,500	
Total Generating Capacity in Kilowatts	33,404,300	33,464,900	
Number of Customers			
Farms in Eastern Area (Included with Domestic)	(512,329)	(502,201)	
Farms in Western Area (Included with Com'l—Large)	(209,407)	(203,926)	
Domestic Service	20,252,244	19,706,381	
Commercial—Small Light and Power	3,710,149	3,656,527	
Commercial—Large Light and Power	527,432	523,956	
All Other Ultimate Consumers	66,405	64,362	
Total Ultimate Consumers	24,556,230	23,951,226	

*By courtesy of the U. S. Geological Survey with deductions for certain plants not considered Electric Light and Power Enterprises.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume II AUGUST, 1934 No. 8

THE RATE QUESTION—A NEW JERSEY CASE

By THOMAS N. McCARTER

President of Public Service Corporation of New Jersey and Public Service Electric and Gas Company, President Edison Electric Institute

Argument at the Opening of the Company's Case on the Petition for Reduction in Electric Rates before the Board of Public Utility Commissioners of New Jersey.

After ten months of floundering by self-constituted tribunes of the people, who, with the aid of an irresponsible and radical theorist, have consumed much valuable time in proclaiming the wickedness of an industry of which they know little or nothing, the proponents of this case have finally rested. The ultimate disposition of the matter is, as I see it, of such momentous consequence to the people of the State, and to the electric industry thereof, that it is fitting that I, who am primarily charged with the responsibility of leadership of this industry in the State, should fully and frankly discuss the issues involved, and point out the line of proof that will be produced to sustain the Company's case.

We are living in a day that is surcharged with hysteria. One form that it takes is an attack upon the Light and Power industry, and the fundamental reason seems to be because it has been reasonably prosperous. Whatever is good should be destroyed! The fad of the day is to imprint upon the brow of success the scarlet letter of sin. When will the American people learn that hysteria, carried to the point of threatened destruction through radical action, does not pay? No one objects to proper regulation of public utilities. All the enlightened utilities of the country have not only acquiesced in but cooperated with it. But over-regulation and persecution have brought the whole railroad industry of this country to the brink of disaster and destroyed its credit. Over-regulation, together with certain other economic factors, has already destroyed

PRESIDENT McCARTER

the electric railway industry as a going concern. Are these things in the public interest? And now the appetite of the radical is not satisfied, and if he has his way the Light and Power industry is listed for the same kind of treatment.

Let us consider what it is all about. The business carried on by this industry is really of four different kinds:

1. Service to the domestic consumer; that is to say, the ordinary householder. And this is the class of business concerning which the politicians become active because in this way they appeal to a large number of voters.
2. What are known as commercial customers, such as storekeepers and places of business generally, who have to be placed in a separate class so far as rates are concerned because of the vast amount of plant they require to be kept in readiness to serve them, of which they make use, generally speaking, only a very small portion of the electric day, and only during a portion of the year.
3. Public or Municipal lighting. This is served at moderate rates.
4. The Power business. This is largely, if not altogether, a competitive business, involving varying uses of current in substantial quantities for long hours, constituting a class of customers who by reason of the quantity and hours of their use are entitled to rates competitive with those rates they would have to pay if they made use of other forms of power.

This brief outline of the business is, I think, sufficient to demonstrate that rate-making is a science by itself. We employ a corps of competent rate engineers whose entire time is devoted to the proper adjustment of these problems. The aim of our Company has always been, and will continue to be, to so adjust rates that each class of business shall pay the fair cost of serving it.

As above stated, the public excitement is all about the first class—the Domestic Consumer. Now we have some 690,000 Domestic Consumers, and the average bill paid by this whole class of customers per month is—What do you think?—$2.80 per month! Less than 10c per day; less than the average smoker pays for a package of cigarettes or a cigar; less than the price of a large loaf of bread; less than half the price of one ticket to the movies; about half the price of one gallon of gasoline, or a quart of

oil. One would think from the shouting that goes on about it that the public were being mulcted out of a large portion of their income by a grasping monopoly, and that the payments made constituted a very substantial part of the family budget. Let us look at the facts. Reliable statistics show that the average family budget, upon a percentage basis, is as follows:

	Per Cent
Food	33
Housing	20
Clothing	12
Coal	3.33
Electricity and Gas	1.67
Sundries	30
Total	100

and as between gas and electricity, a further subdivision may be made of electricity—1 per cent; and gas 2/3 of 1 per cent. Thus this problem which affects 1 per cent of the domestic budget is exaggerated in importance beyond all reason. Surely this agitation is much ado about very little. It is nothing but artificially stimulated buncombe.

Under our system of rate-making an attempt is made to apportion the cost of serving Domestic customers as equitably as possible, but this desideratum is by no means attained because our records demonstrate that 10 per cent of our Domestic customers pay us no return whatever upon the investment cost of serving them with the rates as they are at present; and one-third of our customers do not pay us as much as 6 per cent upon the investment cost involved in serving them. It is because of these facts that Domestic customers in the higher brackets of use pay a much lower price for their consumption over and above a small quantity. The explanation of the facts set forth in this paragraph is that there are certain fixed costs connected with the supplying of service to every customer, large or small, and it logically follows that the smaller the use the greater is the cost per kilowatt of service by the Company to the customer.

The whole principle of regulation rests upon the theory that, because of the peculiar nature of the business, operating utilities shall always be limited to a fair return upon the value of the property devoted to the public use. They are not like the ordinary industrial concerns that are unlimited as to profit, and in good times can lay up proper surpluses with which to meet depressions like the present. Conversely the principle is just as deep-rooted that, as they are limited in earnings in good times, so they shall be protected in earnings in poor times.

For the last twelve years or more, the Board and the Company have negotiated and reasoned together on the question of rates, with the results—so far as I know—satisfactory to both, and to the people of the State. As a consequence thereof, the following rate reductions have been put into effect from December, 1922, to January, 1933, inclusive—a period of a little over ten years:

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
ELECTRIC DEPARTMENT

Rate Reductions,
December 1922 to January 1933, inclusive.

Date of Rate Reduction	Estimated Annual Reduction in Revenue
December, 1922	$1,600,000
May, 1924	1,500,000
March, 1926	10,731
January, 1927	1,000,000
June, 1928	8,640
January, 1929	1,250,000
January, 1930	1,300,000
February, 1931	50,000
June, 1931	136,000
January, 1932	600,000
January, 1933	1,755,400
Total	$9,210,771

In November 1924 the Company increased its Street Lighting Burning Hour Schedule 145 hours 30 minutes, without increasing the rates for Municipal Street Lighting, Private Street Lighting, and Floodlighting.

On January 1, 1928, the Company again increased its Street Lighting Burning Hour Schedule 2 hours 50 minutes, without any increase in rates.

From the foregoing, it appears that over a period of ten years, as a result of this policy, the rates have been reduced approximately a million dollars per year. This means that from a cumulative standpoint, during this period of time, the customers of Public Service have paid something like $50,000,000 less for their electric service than they would have paid had the rates of 1922 still remained in existence, without including the amount saved by customers on the increased use in the years succeeding the rate reductions.

But the point is made that there has been no reduction since January 1933. This in one sense is true. In another sense it is far from true. All departments of Public Service have gone along one hundred per cent with the President in his Recovery Program. All are operating under the NRA. In the Electric and Gas Departments a 6-day week of 8 hours has been reduced to a 5-day week of 8 hours, a decrease of from 48 hours per week to 40 hours per week without diminution of pay. The Federal Government has imposed upon all corporations substantial increases in taxation, and a special tax of 3 per cent upon the bills of the Domestic and Commercial Customers of light and power companies. This item alone in the case of Public Service involves an annual cost of $1,250,000, and the combined increase in cost of these various items is well above $2,000,000. This has all been done without any increase in rate or revenue and is tantamount to the largest reduction that has been made in any one year in the period of years covered by the foregoing table. While we are on the subject of taxation I desire to submit herewith the taxes that have been paid by the Electric Department of Public Service Electric and Gas Company for the past eleven years:

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
ELECTRIC DEPARTMENT

Taxes included in Operating Revenue Deductions.

	Amount	Increase Over Preceding Year
1923	$3,172,885.78	.....
1924	3,255,835.68	$82,949.90
1925	4,068,991.54	813,155.86
1926	5,060,730.26	991,738.72
1927	5,635,785.14	575,054.88
1928	6,749,477.23	1,113,692.09
1929	8,113,813.71	1,364,336.48
1930	8,268,395.43	154,581.72
1931	9,524,192.02	1,255,796.59
1932	10,506,859.73	982,667.71
1933	10,559,146.92	52,287.19
Increase 1933 over 1923		$7,386,261.14

Thus it appears that in a period of eleven years, the taxes of the Electric Department alone have increased from $3,172,885.78 to $10,559,146.92—an increase for 1933 over 1923 of $7,386,261.14. And now the taxes that have been paid by Public Service Corporation and all of its subsidiary companies during the same period of time:

PUBLIC SERVICE CORPORATION OF NEW JERSEY
AND SUBSIDIARY COMPANIES

Operating and Non-Operating Taxes included in Consolidated Statement of Operations.

	Amount	Increase Over Preceding Year
1923	$8,555,133.74	.....
1924	8,816,309.79	$261,176.05
1925	10,186,632.95	1,370,323.16
1926	11,542,293.30	1,355,660.35
1927	12,188,056.31	645,763.01
1928	13,618,959.60	1,430,903.29
1929	15,458,564.64	1,839,605.04
1930	15,439,179.73	*19,384.91
1931	16,953,176.77	1,513,997.04
1932	17,918,196.15	965,019.38
1933	17,785,065.51	*133,130.64
Increase 1933 over 1923		$9,229,931.77

*Decrease.

The total of these taxes paid during the eleven year period is $148,461,568.49, which is a vast contribution for

any one interest to have made within such a period of time toward the cost of government. It would appear to be of doubtful wisdom for the State, through any agency, to do anything that would endanger the future payment by this interest of such fair and reasonable taxes as may be assessed against it. In my opinion, the foregoing taxes are not fair and reasonable.

Now what is the duty of the Board in a case like the present? It is as defined by the statute creating the Board, "to fix, after hearing, just and reasonable rates." A just and reasonable rate is one that, under all the circumstances of the case, is fair to the public and to the investors in the enterprise. It should take into account and make allowance for every element of an existing situation. It is not a rate whittled down to as low a point as possible that will withstand the scrutiny of confiscation that would be applied to it by the Federal courts—which latter yardstick is the only concern of the Federal court. The highest court of this State—The Court of Errors and Appeals—has twice gone on record in the famous Passaic Gas Case, in defining the yardstick which the Board should use in arriving at a just and reasonable rate. And that yardstick is eight per cent upon the fair value of the property devoted to the public use, arrived at by the application of proper methods, which have all been defined both by the Federal court and the courts of this State, and which include a proper allowance for going value—placed in the Passaic Gas Case at 30 per cent of the physical value, after deducting observed but not theoretical depreciation. The highest court of this State has never deviated from that position, and it is and should be the law of the land until changed in a lawful manner.

It is the fashion of the theorists to belittle and decry substantial allowances for going value, because the individual items thereof cannot be defined with the same precision as can more tangible property. Going value of a successful enterprise is just as truly a factor of value as the bricks, the mortar, and the electrical machinery that go into a power house. Various elements enter into it, such as the cost of establishing the business; the value of the business built up over a long period of years; consolidation value; and franchise value, if any, is to be allowed.

A year or so ago when this case started, the attitude of the Board was that it desired to expedite the disposition of the matter as rapidly as possible. To cooperate with this desire of the Board, it was impractical to make an inventory of the property, as would be the most thorough way of finding its true value, within the time then supposed to be available. Had we had any idea that the case of the proponents would have dragged on all this time, we would have taken advantage of the long period to have had such an inventory made. But in the absence of it, we have done the best that we could. We have employed perhaps the best known firm in this country in this kind of business. I refer to Ford, Bacon & Davis of New York. And we have employed in certain features of the work the well-known and experienced Professor Henry C. Anderson of the University of Michigan.

Messrs. Ford, Bacon & Davis, who start just where Major Barry, the Board's engineer started, take the value of the property as found fifteen or more years ago—add to it the actual expenditures from that day to this—and apply thereto the trend of prices existing at the present time to the actual costs. Professor Anderson, who has carefully examined the property, will show the amount of accrued depreciation of the property, which will be deducted from the base rate otherwise found by Messrs. Ford, Bacon & Davis, and the result —something in excess of $400,000,000 —will be found to be the proper rate making base for this wonderful property. Commissions have a careless way of deducting from the rate base the entire depreciation reserve that may have been accumulated by a company for use in the future. There is no warrant in law for this. That fund, so accumulated, is, of course, not available for dividends, and must be held to take care of future depreciation or obsolescence, but as thus qualified it belongs to the company and is an asset. All the authorities hold that only actual observed depreciation to the property is rightly deductible from the rate base.

In connection with the proper rate base for this property, I am informed that much criticism has been made by the proponents of this proceeding of the fact that the Company in the past has acquired a larger amount of real estate than is now actually used for home office purposes, and for future power station sites. My answer to this is that had the Directors not thus acted they would have been woefully negligent of their duties. When these transactions took place, the Electric end of our business was compounding at the rate of 20 per cent per year, with every indication of an indefinite continuance of this tremendous growth. So too the Gas property was making very substantial gains. The depression of the last few years was not anticipated. We proceeded from the real estate standpoint—from a home office standpoint, in exactly the same manner that all wise life insurance companies have done, viz., to anticipate for a reasonable future the office space requirements we would need. I have never yet heard of the Insurance Commissioner of New Jersey, or any other State, throw out such investments by life insurance companies as improper assets.

So too with power station sites. Properly located power station sites for the future are few and far between, and it would have been an act of folly not to have protected the people of this State by the acquisition of such sites while they were still available. When recovery comes and this Company again gets under full steam, the wisdom of the Directors in taking time by the forelock will be abundantly vindicated. Some of the property thus acquired was originally taken in the name of the Corporation, or one of its holding companies, but in the final disposition it was all for the benefit of the Electric and Gas Company. I understand that it has remained for the gentlemen of the opposition to criticize certain of the purchases because they were properties that were owned in whole or part by my brother, now deceased, and myself. I have only to say with reference to this that in each case the purchases were made upon the recommendation of specially appointed committees of the Board of Directors, upon definite real estate appraisals by independent authorities, followed by affirmative action of the Board of Directors, in which neither my brother nor I took the slightest part. So far as I know, this is the first time that any one in this community has ever sought to asperse the integrity of the family name which I bear.

Now the net earnings of the property for the year ending May 31, 1934, which are naturally the latest figures available, are approximately $27,300,000. It is a simple mathematical calculation to figure out what the percentage of earnings is on the rate base as above

outlined. But this is not all. The annual figures just referred to only include the 3 per cent electricity tax assessed by the Government for a portion of the 12-months' period. Nor do they reflect the fact that during this last spring we have restored to the employees of the Company one-third of the 15 per cent wage cut to which they had previously been subjected, and to which modification they were in all conscience entitled. When these adjustments are made, the earnings for the 12-months' period will be found to approximate $26,000,000.

Because of the limited time that I have had for the preparation of this opening, I do not name these figures with absolute accuracy, but they are substantially accurate and are on the safe side. Nor do these figures take into account the already existing and further anticipated rise in the cost of all commodities used by the Company, both for construction purposes and operating expenses. Coal and oil prices, not to mention the general commodities, are now far in excess of the prices that we are paying for them under our existing contracts.

But some one will say "these contracts have a year or more to run." And so they have. But are the investors in this great enterprise to be held down to the absolute limit of present-day costs in the face of an existing situation as at present? Are they to receive no benefit from the action of the management that was wise and far-sighted enough to make these contracts? Is every dollar of this advantage to be taken from them and given to the public? Is there to be no incentive or reward for good management? If the same contracts were made today, at prevailing prices, the increased cost of operating in the Electric and Gas Company for fuel alone would involve a large additional expense, and it is the best judgment of our Purchasing Department that by the time these contracts expire, prices will have risen still further very substantially.

Notwithstanding what has been said, the claim is vociferously made that Public Service rates suffer by comparison with rates in certain other cities which are mentioned. Making rates by comparison is a very dangerous experiment and utterly unscientific. Before we can make any proper comparison we have to know a great variety of things. Some cities have water power. New Jersey has none. We have to know the availability of coal supply and the freight rates paid thereon. We have to make a thorough-going comparison of taxes paid by one company and by another in different States. In New Jersey the taxation cost per kwhr of electricity generated is now higher than the cost of generating the same unit.

Some companies with apparent low rates serve one compact municipality. We serve over two hundred municipalities stretching from the largest city in the State to small hamlets, with lines running over one hundred miles in length. Our rate is a State-wide rate —a principle countenanced and approved by the Board of Public Utility Commissioners many years ago. Our situation cannot be compared with service rendered to one compact municipality. It is also true that there are quite a number of situations in the country that have been driven into unconscionable and unscientific low base rates as a result of just such agitation as the one before us. Thereafter the attempt is made to use these unjust rates as a yardstick with which to compare rates of other companies. Two wrongs never made a right! Our rates, however, are lower than those of any other company operating within the State.

All that I have said to date, except in so far as I have referred to the vast increase in taxes paid by all departments of the Corporation, has related to the Electric business of the Corporation alone, as though there were no complicating factors of any kind whatever. Every intelligent citizen of this State knows that that is not the fact. The business of the Corporation consists of the three great branches of the utility business: The electric business; the gas business, and the local transportation business. I have been speaking of the electric business. I will not stop to discuss the gas business. It is not earning a full fair return upon the value of its property devoted to the public use, but it is a reasonably successful going concern. Not so with the local transportation business. For the thirty-one years of its life, the Corporation has borne with this burden. A proper system of local transportation is absolutely essential to the welfare of the people of this State despite the changed habits of the people and the tremendous activity of the automobile industry, and the use of motor cars. It is the business of this unit of our activities to serve all the people of all the territory within which we operate. Not merely lines on Broad Street, Newark, but lines in outlying territory; the bitter with the sweet—and to maintain a proper continuity of a local transportation system.

This arm of the business has always been difficult, troublesome and lacking in financial stability. Fifteen years or more ago, a situation already bad was aggravated by the appearance of the jitney car and later the jitney bus, upon the better thoroughfares of the cities of the State. The continuity of the whole transportation system was threatened and a condition of chaos in it appeared likely. With not only the knowledge but with the direct approval of the then Board, the Coordinated Transport commenced to acquire the rights of these jitney buses, in many cases, at large cost —the then Board distinctly saying they believed it to be necessary for the Coordinated Transport to do this in order that the continuity of the local transportation system of the State should be maintained.

Simultaneously therewith and thereafter, there was much disturbance over transportation fares upon this system, until finally the Company made an application for a ten-cent fare—the lesser and different fares theretofore tried out having proven inadequate. Once again at the direction and written request of the Board, a return was made to the five-cent fare, splitting, however, the old existing zones into a city and a suburban zone. The Board was of the opinion that it was distinctly to the interest of the people of the State that the five-cent fare, now almost an anachronism elsewhere, should be preserved. The Company went along. And from that day to this there has been not a legal but a moral understanding with the Board that all these facts would be recognized from time to time in the adjustment of our electric rates, known to be the most profitable end of the Corporation's business.

The burden with the changing habits of the people has been very severe, until now we have in our Coordinated Transport system $80,000,000 of actual cash invested, upon which we are receiving no return whatever and, in addition thereto, last year lost nearly $1,000,000 in operating. Therefore, the Corporation is carrying the Transport burden at an expense to it on a 6 per cent basis of from $5,000,000 to $6,000,000 per year. The radical theorist says however "all this is just too bad" and has nothing to do with the amount that should be allowed by way of return upon the electric property—which he would hold

down to the proverbial pound of flesh. Notwithstanding all this, we are not asking for any increase in rates. We simply do ask that our electric rates be not interfered with until they show an earning upon a proper valuation, with all elements included, in excess of the 8 per cent already determined by the courts as just and reasonable. When they do show such an earning, we will be glad to voluntarily reduce them to that point.

It must also be remembered that there is looming up for consideration by the next Congress the problem of social insurance both as to unemployment and old age pensions. The President has definitely announced this as part of his policy, and that the expense thereof should be borne by employer and employee contributions to a fund which should be paid into an arm of the Government at Washington for distribution, instead of raising the funds therefor by general taxation. In the case of the railroads, pension legislation has already been passed which, if I am correctly informed, will add 4 per cent to the railroad payroll. This, of course, will be substantially increased if unemployment is also covered. This policy, if carried out, is a complete innovation in American industrial life. In any consideration of the rate problem it must be considered and cannot be ignored. In my opinion, to meet all the factors herein discussed, many companies will be required to apply for an increase over existing rates in order that they may properly function.

Utilities are not like ordinary commercial concerns. We cannot pass on additional costs to our customers, as is so generally done in industrial and mercantile life, except at the end of a long-drawn-out rate case. Even certain newspapers which have so virulently attacked us have been compelled to meet their problems by an increase of 50 per cent in the sale price of their product. I do not criticize this. On the contrary, I have no doubt that their action was within every principle of sound economics. I do not pretend to understand their problems, but perhaps I know quite as much of their difficulties as they know of ours. We have no Magic Wand or Aladdin's Lamp by means of which monies will gush forth. All our revenues come from our customers. We have met the problems of the depression as they have come along:

1. We have reduced Common dividends 17 per cent.
2. We have reduced senior salaries 25 per cent; other salaries and wages a net 10 per cent.
3. We have made the reductions in rates that have been above set forth.

Our aim has always been and will continue to be to strike a fair balance between the various classes of consumers, the employees and the investors.

Should there be imposed at this time a further substantial rate reduction, it is manifest that it can only be met by another reduction in the common dividend or a further reduction in wages, or both. I do not believe either would be in the public interest. Nor have I heard any one, however radical, recommend them.

There seems to be an impression abroad that somehow, some way, such a reduction could be made and the present status quo maintained. As shown in the array of figures in the earlier part of this opening, the domestic consumer, who is the main solicitude of the radical and the politician, is the one least entitled to any decrease in rates, if such a decrease could be made with propriety, and it was there also demonstrated that the matter is largely *de minimis*.

Artistic lighting effects are used on this statue on display at the exhibit of the electric light and power industry at the Chicago World's Fair.

New Jersey is one of the original thirteen States. Its people have always been conservative and lawabiding. I indulge the hope that this commonwealth will never join that array of sovereignties that now find it fashionable to repudiate obligations. Nor that it will ever deny proper justice to either personal or property rights. Is it wise in a time of stress like the present to depart from our traditions and run after the false gods of radicalism and injustice?

Some years ago the Supreme Court of the United States expressed itself on this subject as follows:

"Our social system rests largely upon the sanctity of private property, and that State or community which seeks to invade it will soon discover the error in the disaster which follows. The slight gain to the consumer, which he would obtain from a reduction in the rates charged by public service corporations, is as nothing compared with his share in the ruin which would be brought about by denying to private property its just reward, thus unsettling values and destroying confidence."

It would be a sorry day for the people of the more thickly populated sections of this State, served by the various interests of this Corporation, if its operating units were so hampered for political or other reasons, as not to be able to go forward with the construction that will be required with the return of a better day.

The misdeeds or mismanagement of those connected with large holding companies in other parts of the country, which have properly created resentment, have nothing to do with this case. Mistakes of judgment we may have made, as unfortunately take place in all human activity. Otherwise I have nothing to apologize for in the thirty-one years of my stewardship.

I appeal to this Board, when the evidence is all in, to decide this case upon an economic and not a political basis, and to do justice to the people of the State, to the vast number of security holders of this enterprise, of whom there are nearly 100,000 stockholders of the parent Corporation, exclusive of all bondholders and underlying security holders—and to keep this great enterprise, to which it has been my privilege to devote my life, in a position to function at all times for the best welfare of the people of the State.

BRONZE BUST OF EDISON ACQUIRED BY INSTITUTE

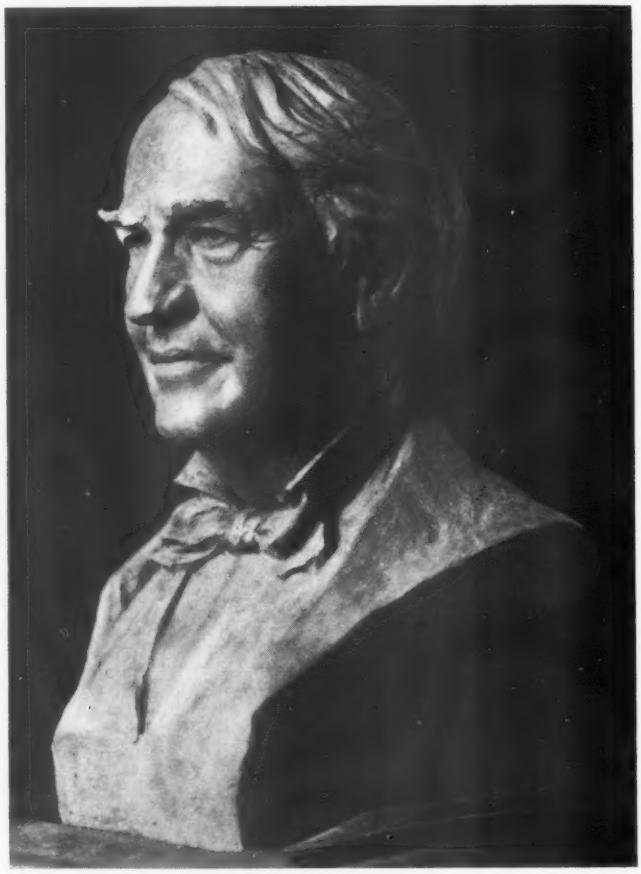
The Edison Electric Institute has acquired the bronze bust of Thomas A. Edison illustrated on the cover of this issue. The bust, a remarkably sensitive interpretation of the great electrical genius, is the work of Walter Russell, painter-sculptor. Somewhat larger than life-size, the bust has been placed in the conference room at the general offices of the Institute, where it occupies a place of honor.

The original bust was ordered by the late Dr. John W. Lieb, Vice-president of the New York Edison Company, a great admirer of the work of Mr. Russell. Dr. Lieb was anxious to have produced a symbolic portrait of Mr. Edison, instead of a cut and dried photographic likeness depicting one stage of a life instead of the whole of it. Dr. Lieb wanted the spirit of Thomas Edison rather than the flesh, the likeness which the public would recognize as covering a life-time of memories of him, rather than the one moment of any particular page of his career. Dr. Lieb believed Mr. Russell could accomplish this, and the present work is the result.

Mr. Russell studied his subject in Florida, and for many months he sat close to Mr. Edison at dinners and public occasions, besides observing him at work, until Mr. Edison became a living image in his mind. The sculptor also studied every photograph of his subject from babyhood on, until, as Mr. Russell tells it, a composite symbol of the great man sat for him in his studio, in the spirit, as he did the bust over and over for seven times, until he was satisfied that he had produced what his client wanted.

Photographs of the bust were made and shown to Dr. Lieb on what proved to be his death-bed. He was greatly pleased with the result and sent the artist an enthusiastic message of congratulations. Unfortunately, however, Dr. Lieb died and subsequently the contract was taken over by Mr. Preston S. Millar, who acquired the original bronze and loaned it to the Edison Pioneers.

The bust has been exhibited and has won the approval of the critics and the art world. Boris Luban, painter of Mr. Edison, has said that he considered the bust to be the "best sculptured portrait ever done of this great man, and the only successful one." An official of one of the great galleries has pronounced it one of the best portrait busts in America. Jo Davidson, the sculptor, praised it highly but told the artist that he would like it better if there were more of the shoulders and body. Mr. Russell is adding to it as suggested, and is making a heroic-size enlargement of the bust.



Profile View of the Bust

Some of Mr. Edison's close friends have had the bust reduced to desk size and purchased copies. The New York Edison and affiliated companies have placed a copy of the bust in a niche in the corridor of the offices at 4 Irving Place. Japan and France have also purchased copies. Mrs. Edison recognized the symbolism of a life time in the work and paid the artist a visit, taking the sculptor's own copy home in her car with her, together with a desk-size replica.

Walter Russell was for the first part of his life a portrait painter, noted especially for his portraits of children. He has painted the portraits of all the children of the late Theodore Roosevelt and of many notables all over the country. Among his famous adult portraits in oil and sculpture are Hudson Maxim, Sir Thomas Lipton, Thomas J. Watson, Cass Gilbert, Ossip Gabrilowitsch, Dr. H. H. Sheldon, Eva La-Gallienne and the official sculptured portraits of Mark Twain.

He is now at work upon a monumental Memorial to Mark Twain in which there are seven groups of the author's sculptured characters emanating from the author as the central figure. The first group of twenty-six figures will be dedicated on Nov. 30, 1935, on the centennial anniversary of Mr. Clemens' birth.

Mr. Russell never touched clay until he was fifty years of age. The change of medium came suddenly, like a rebirth, he says, but since the change he has almost abandoned painting.

McGraw Prize Paper

MEASURES OF OPERATION AND MAINTENANCE FOR OVERHEAD ELECTRIC DISTRIBUTION

By FRANK E. SANFORD

An annual report of distribution feeder and transformer operation is summarized in this paper. Relative merits of several methods of reducing troubles are studied, and a suggestion made for wider interest in the often neglected small cases of local trouble.

During the past few years—and notably since the reduction in major expansion and construction programs—the distribution divisions of the electric utility systems have received greatly increased attention. While industrial kwhr consumption, especially by large manufacturing customers, has declined steadily with business activity in general, domestic consumption has increased and general commercial business has held its own level. Thus the proportion of the total energy delivered over the widespread lower capacity lines and equipment has increased. This shift in load and demand responsibility, coupled with increased public interest in electric service, has served to focus attention on distribution.

This trend is by no means peculiar to electric supply alone. Intensive studies of sales and distributing channels and methods have been made by almost every manufacturer of commodities. Where new plants and machinery for increasing production received major attention in the business boom years, warehouse stocks, movement of goods and retail outlets have been scrutinized in the subnormal business years. In the electric supply industry power plant capacities and system interconnections were ample and the big problem has been to make the most efficient use of the distribution facilities and to deliver energy to the consumers. Increased interest in distribution problems has marked the meetings of engineering groups, the activity of electrical equipment manufacturers, and the articles and papers in technical magazines.

It is the purpose of this paper to review a number of the operating and service aspects of electric distribution, to study in detail the effectiveness of several maintenance policies and to present a possible perspective viewpoint of distribution as a part of the electric system. No attempt is made to present an economic analysis, except as the methods considered affect economy of construction and operation.

Mr Sanford, winner of the 1934 First McGraw Prize was born June 19, 1904, and attended rural public school and high school at Conneaut, Ohio. In 1921 he began at the University of Cincinnati in the cooperative course College of Engineering, and in 1922 started with the Union Gas & Electric Company, Cincinnati, Ohio, working alternate months.

For three years he worked in different crews in the Overhead Transmission Department and during his last year at the university attended school half day and worked half day on transformer installations, estimating, and switchboard wiring. Graduated from the university with degree Electrical Engineer in 1926. Member Eta Kappa Nu, honorary E.E. fraternity.

He continued in the Transmission Department on inspection and estimating and in January, 1928, was appointed transmission engineer. In January, 1931, Mr Sanford was appointed distribution engineer in the Electric Distribution Department.

He has been active in the employees educational activities of the Mutual Benefit Association and during the past two years has been Director of Education M.B.A.

Distribution is the division of a system which carries the energy to the customer's wiring. To the customer whose lights go dim, or off, it matters little whether the cause is a wire down in front of his own home, a transformer failure nearby or in the substation, or a major system disturbance. The result to him is annoyance and perhaps loss. True, from the utility's point of view it is more serious to have several thousand customers affected by the system disturbance than it is to have one or fifty or one hundred affected by a blown primary fuse. But when viewed from the standpoint of a year, the total customers inconvenienced and the total loss of good will and revenue may be as great or greater from the many individual troubles as from the one or two general troubles.

In general merchandising distribution three measures are usually most important—supply, quality, and cost. Similarly, three measures are applicable to electric service—availability, character of voltage, and cost.

(1) Availability, or continuity of service, may be expressed in terms of total interruptions to service, in percentage of time that the units in service are available for service, or in use units (kv-a-hr) outage. As a refinement on this measure, the time the outage occurs may be considered, as it has a bearing on the actual load affected.

The addition of refrigerators and clocks to residential loads on electric service did much to increase the widening of demand for continuous service. It is certain that the increased dependence upon electricity for the routine of living has and will continue to increase the necessity for uninterrupted service.

(2) Voltage conditions are reflected mostly in lighting load. A few volts variation, or an occasional fluctuation, is noticeable and annoying. Voltages above or below standard cause shortened life of lamps on the one hand, and loss of light to the customer and of revenue to

the utility on the other hand. Variation of voltage, either from time to time, or rapidly fluctuating, is most annoying.

Interference is also considered with voltage conditions. This may be due to faulty equipment, loose connections or other conditions on the supply line, or to motors, signs, or other utilization equipment. Interference to radio reception was a considerable problem a few years ago and still requires constant attention. Interference to telephone operation is occasionally caused by distribution line conditions, and flickering lights caused by neighboring appliances often bring strong complaints on service.

Improvements in Equipment Available

The fundamental of the electric supply system is a generator and wires to deliver energy to a group of electrically operated devices. The first central station of Edison had this fundamental characteristic and practically none of the multitude of devices that have since been added to the system. All of these devices—transformers, switches, relays, regulators—are essential now because of increased size of area served. Each addition to the fundamental has brought new problems with it, and the greatest program of research and development ever known has been the result.

The acid test of each of these additions is, and must be, "What has this to do with delivering a continuous, steady, economical supply of electrical energy to the point of consumption?"

Recent years have brought an unusually large number of new developments in methods and equipment. All the way from an entirely new plan of distribution to the perfecting of connectors, these new developments have promoted and assisted in the operating job of distribution. Careful study, thorough consideration, test and experiment, followed by trial and a year or more of use, should, and nearly always does, precede the adoption of these new ideas on an extensive or standard basis. Local conditions, present equipment and construction and many other individual factors must enter in the final comparison.

Often, these new developments are advanced as the answer to a given problem. In so far as they are seen in their proper perspective, each has its place—but care must be used that in the enthusiasm for the new idea or device the existence of hundreds or thousands of the older units is not dropped from the viewpoint. While a gradual change to a new type transformer, or fuse, or arrester, or metering method, may be in order, it is seldom that the comparison is so overwhelmingly in favor of the new as to justify a complete discarding of the old.

An Annual Operations Report

In a regular tabulation of troubles, complaints, changes made, and results obtained, the principles advanced above may serve as a guide or "yard-stick." Briefly summarized, they are — (1) measure continuity of service, and (2) measure voltage control.

Just as the annual accounting of profit and loss and the inventory are invaluable to the business executive in outlining his policies and program for the next year, these annual summaries of operation serve the distribution superintendent and engineer in maintenance and construction programs. If the tabulations are made monthly and then summarized at the end of the year, they are of constant value, not only to those to whom they are submitted but to those charged with the individual jobs as well.

In the paragraphs and charts which follow, a review of such a report is given, based largely on 1933 operation. Data on changes in the system, additional installations, feeder loading, etc., are omitted in this summary. The complete report covers a central division and three smaller divisions of a system of 140 feeders serving 187,000 residential customers and the portion of 28,000 commercial customers outside the underground network area. Industrial service to 5700 customers is divided among the overhead distribution, sub-transmission and network systems. The load density on "urban" feeders varies from 1000 to 10,000 kv-a and on the "suburban" feeders from 150 to 2500 kv-a total connected per square mile. Street lighting is served mainly by separate series circuits from the substations, with some constant current transformers supplied from the 4 kv feeders.

Overhead distribution lines are operated three-phase four-wire 2400/4150Y volts with all single-phase transformers (except some rural) connected phase to neutral. The central transmission system is at the generating voltage of 13,200. Tie lines between substations and subtransmission feeders also serve the larger power loads and in addition a number of outlying distribution substations. For distribution centers in outlying territory supply to the substations is at 33,000 volts. There are two power plants in the area, West End Station in Cincinnati, and Columbia Station outside the city with 66 000 volt transmission into the opposite side of the main load area.

Interruptions of Service

Through the activities of the A.I.E.E. and the former N.E.L.A. committees, a basis of operating comparisons for transmission lines has been quite widely adopted. Outages per 100 miles of line per year for various types and voltage lines can be compared. This basis does not, however, give a complete picture of operation on the distribution lines. It is possible that a number of feeders with many miles of line can operate several years without an outage—and yet that the customers served by those feeders have very poor service.

Transformer failure records are commonly compared on a percentage basis. Blown primary fuses at transformers or at branch lines from the main feeder, may be compared in the same way. Wide differences of load density and transformer size and spacing may confuse the comparison. Sometimes transformer and other troubles are also put on a number per 100 miles of line basis. For any one system, a year by year comparison on this basis is sufficient, but it is not practical for comparing different load density sections of one system or of different systems. For example, a comparison between two companies showed 9.7 transformer coil failures per 100 miles of line for one, and 0.063 for the other. On a percentage basis, however, the first company had 0.62 per cent and the second 0.69 per cent.

A formula which has been used and which gives a very good measure of service, is "availability"—the percentage of connected capacity to serve that is available to the customer. Expressed in another way, it is the kv-a-hr total of outages compared to kv-a-hr available if no outages had occurred. Since the unit sold is the kwhr, the logic of this basis is obvious. Some practical disadvantages are apparent also, but when the per cent of units in trouble, feeder outages, and details, are used in conjunction with such a summary figure, the operation perspective is fairly complete.

Availability on the urban section of the distribution system for 1933 was 99.99787 per cent, or in other words, there were 2.13 kv-a-hr outage per 100,000 kv-a-hr operation. On the suburban section the outage was 4.67, and on the rural 20.64 per 100,000 kv-a-hr. These figures are detailed by location of troubles, in Table 1.

A summary and classification of distribution line troubles and transformer

troubles is given in Tables 2 and 3. This is for the 64 urban and suburban feeders. For the past two years, 92 per cent of the feeder outages have been for less than one minute—that is, the trouble was cleared on reclosure of the feeder switch. The most outstanding improvement in feeder outages has been from reduction of fuses failing to clear, or not clearing ahead of the relay operation.

It is doubtful that much further reduction can be made in feeder outages due to distribution line troubles, at least on urban and suburban feeders. Fusing of branch lines, or taps from the main feeder, as it is done on this system, helps to reduce the number of feeder outages. The balance must be between a possibility of long time outages to a part of the customers and a larger number of short time outages to all the customers on a feeder. Without these sectionalizing points an entire feeder might be held out of service while many miles of line are patrolled to locate a wire down, or other trouble.

To obtain these records it is, of course, necessary to inspect and check each case of trouble. The inspection includes all conditions of the installation which might in any way contribute to a better classification of remedies and corrective measures. Foremost of several reasons for this check and tabulation of troubles is a study of conditions which may be changed on present and future installations and constructions. Local conditions, as well as maintenance and operating policies, may have a large bearing on the conclusions of causes and corrective measures.

The biggest field for improvement in service is by reduction of trouble at transformer installations. These interruptions, although each affects a small percentage of the customers on a feeder, are almost always for much longer periods of time. Careful inspection is often necessary to differentiate between lightning and secondary short circuits as cause of trouble during a storm. Possible remedies are so radically different, however, that the distinction is essential if improvement is to be expected.

It is most convenient to study the details of these causes and conditions when in graphic form. The accompanying charts, Figs. 1-4, inclusive, show several such analyses much more clearly than would the original figures on which they are based. In these charts the units in trouble are shown as a percentage of the number or estimated number of units with similar condition.

Interconnection. Before the lightning season of 1933, eight feeders were selected which had higher than average percentages of transformer troubles in 1932, for trial of the interconnection of grounding. These feeders are mainly in the lower load density areas of the suburban group. Lightning arrester grounds and secondary neutral grounds were tied together only where inspection showed there were two or more water pipe grounds on customer's premises, on the secondary.

With this conservative policy, interconnection was made at a total of 708 installations. There were no failures caused by lightning, in this group. At the same time this work was done, an inspection of the installation was made and fusing and other conditions were checked and corrected. While this limited experience is not sufficient for a definite conclusion, it does check with the records of other companies. It is planned to continue this more extensively in 1934.

Inspection and Repair. During the past six years a regular schedule has been followed for inspection and repair of transformers in service. Oil, leads, bushings, arresters, fuses, and ground connections are checked, and repaired where found necessary. The transformer case is cleaned and painted. In addition it is the policy to return to a central repair shop all transformers removed from service due to rebuilding, rearrangements or other reasons. After complete disassembly and cleaning they are put in first-class condition and given the same

TABLE 1—KV-A-HR OUTAGES IN PARTS OF 100,000 KV-A-HR IN OPERATION

	Distribution Trouble					
	Feeder Outage	Branch Line Fuse	Transf. Fuse or Failure	Total	Transmission or Substation Trouble	Total
32 Urban feeders	.71	.80	.62	2.13	0	2.13
32 Suburban feeders	.68	1.14	1.39	3.21	1.46	4.67
14 Rural feeders	2.80	2.40	.74	5.94	14.70	20.64

TABLE 2—FEEDER OUTAGES—URBAN AND SUBURBAN

Feeder relayed out during storm	9	
Wire burned down by lightning	5	
Failure of lightning arrester	3	
Lineman caused short circuit	1	
Wire down by causes beyond control	8	
Failure of pothead	1	
Failure of station equipment	9	
Outage of transmission circuit supply	34	
Total feeder outages	70	
Outages due to distribution line trouble	27	
Per 100 miles		4.7
Fuses blown on overhead branch lines	56	
Per cent (598 locations—971 total fuses)		5.8
Total overhead troubles per 100 miles of line		14.8

TABLE 3—TRANSFORMER TROUBLE—URBAN AND SUBURBAN

	Fuses Blown	Failures
Fuses blown	146	
Transformers failed total (See Note)		65
Percentage (6,810 transformers)	2.13%	.94%
Percentage of kva. (137,000 kva. total)	1.81%	.66%
Transformer coil failures		53
Percentage coil failures		.76%
Cause:		
Lightning	55	23
Short circuit due to line or tree conditions	24	18
Short circuit, mechanical or service	12	7
Overload	5	5
Mechanical	14	6
Unknown	36	6

Damaged Part—Transformer Failed

H. V. Coil only	10.9%	H. V. Bushing	2.0%
L. V. Coil only	11.1%	L. V. Bushing	2.9%
Both coils	59.5%	Term. or leads	13.6%

Note: Transformer failure counted as all cases where transformer is removed from service following repeated blowing of primary fuses.
Fuse blown—does not include fuses blown by transformer failure.

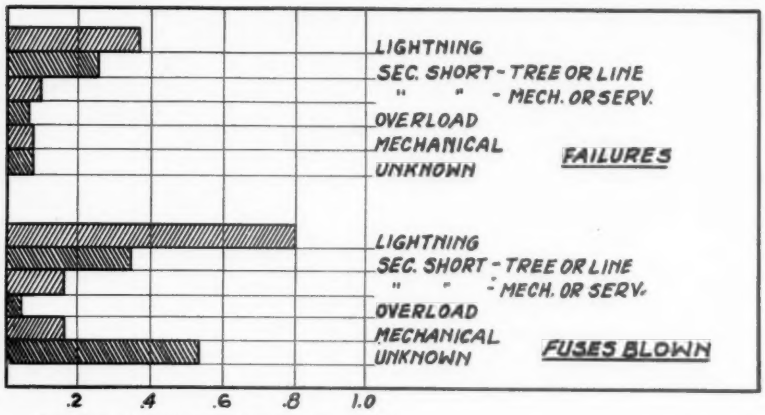


Fig. 1—Causes of transformer trouble

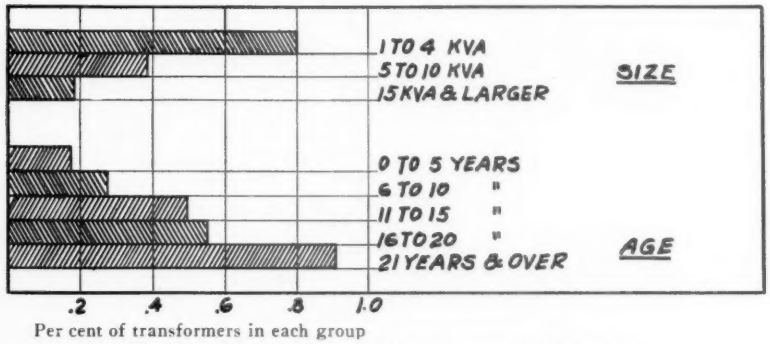


Fig. 2—Age and size of failures caused by lightning

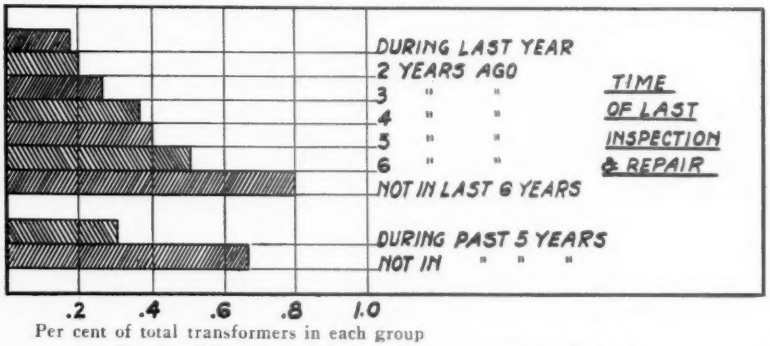

DURING LAST YEAR
2 YEARS AGO
3 " "
4 " "
5 " "
6 " "
NOT IN LAST 6 YEARS
TIME OF LAST INSPECTION & REPAIR
DURING PAST 5 YEARS
NOT IN " " "
.2 .4 .6 .8 1.0
Per cent of total transformers in each group

Fig. 3—Effect of repair on failures caused by lightning

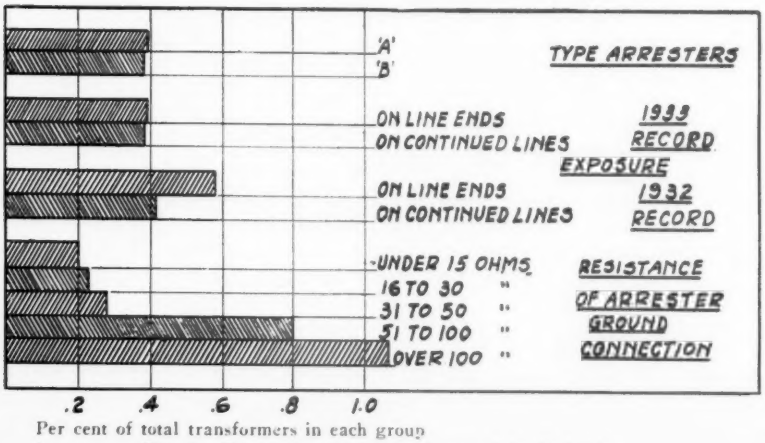


Fig. 4—Protection of failures caused by lightning

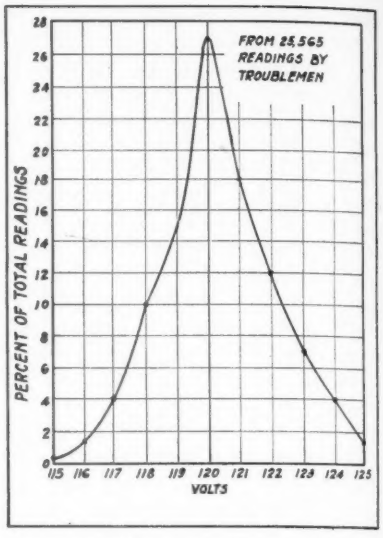


Fig. 5—Service entrance voltage

tests as new transformers, before again being placed in stock.

Fig. 3 shows the value of this work in reducing transformer failures. An even greater reduction is made in the blowing of fuses due to insulator and lead troubles and internal flashover due to low oil level. A three-year average indicates that this inspection and repair policy reduces troubles between 50 and 60 per cent, comparing transformers inspected during the previous five-year period to those not inspected in this period.

Grounding Resistance. The data shown in Fig. 4 check fairly closely with theoretical consideration and other tests on satisfactory grounding conditions. A value below 50 ohms for a single driven rod has been found readily obtainable in most cases in this locality. As part of the inspection and repair in service routine, 1700 grounds were checked in 1933. The installations had been made over a period of two to ten years or more previous. Eighteen per cent of the arrester grounds were above 50 ohms as found. This was reduced to less than 4 per cent. The average resistance on the repaired feeders is now about 25 ohms.

Application of Primary Fusing. In 1931, after a study and extensive tests on primary fuses and fusing application, a new basis was adopted using newly developed bi-metallic links. This was reviewed in a paper presented by the writer at an A.I.E.E. district meeting at Kansas City, Oct. 22-24, 1931. Companion papers on principles and design of expulsion type fuses were presented by representatives of two manufacturing companies. The new fusing was based on short circuit rather than overload cur-

rent, and coordination of relay settings with fuse time-current characteristics was provided.

Relaying open of the feeder switch due to too slow blowing of the fuse at some values of short circuit current, or due to shattering of the box and failure to clear, has been reduced as the new fusing has gradually been applied throughout the system. On the entire 140 feeders there were 24 feeder outages from this cause in 1930; 16 in 1931; 8 in 1932, and none in 1933.

At the same time that this reduction in feeder outages has been effected, local outages due to transformer fuses blowing have also been reduced. Plug type cut-outs were in use on a majority of the older installations, and experience since the decision to replace them has confirmed the practical value of the new basis. The 1933 record shows 4 per cent of the plug-type fuses in service blown during the year, compared to 1.7 per cent of the smaller type expulsion fuses. In 1932, 2.3 per cent of the plug-type and 1.1 per cent of the expulsion fuses in service were blown. Many needless fuse blowings and resulting outages are thus eliminated.

Voltage Control

All of the 64 feeders in the urban and suburban divisions have single-phase induction-type voltage regulators, compensated for phase area control. The regulator settings and operations are checked semi-annually by voltage charts taken at test points in each phase area. This central division and one other division are covered in about two years by a night-reading crew checking transformer loading and voltage and secondary end voltages on all single-phase transformers. A summary of this routine check for the central division is given in Table 4. In addition to this work, the same crew checks current in the constant current street lighting transformers on the same feeders and makes special tests as required.

A further check of voltage conditions is obtained by readings at the customers' service entrances. These readings are taken by the troublemen who replace blown service fuses. High and low readings are checked by the voltage complaint inspector. All of these data—charts and readings—are used by the engineers on voltage control to lead to correction of transformer and wire capacity and arrangements. Two measures of the effectiveness of the voltage control operations are used; first, average system voltage readings; second, voltage complaints received. The average of the 2623 transformer secondary readings was 121.1 volts, and of 3169 secondary end readings, 119.5 volts. The average of 25,565 entrance switch readings detailed in Fig. 5, was 120.2 volts. Seventy per cent of the total number of readings were between 118 and 122 volts. All of the reading data are kept in detail by feeders together with the justified voltage complaints on each feeder.

Transformers for residential service are loaded on the basis of carrying 160 per cent of their rated capacity at the time of peak load. Loading curves have been plotted to give the transformer size required for any ampere reading during the year. These curves are based on average residential demand curves, temperature rise, and ambient temperature for the type loading and conditions of this locality. Two measures of the effectiveness of this method and the periodic check are: first, the very small number of transformers failed due to overload even with the continued increase in residential consumption; second, the ratio of connected transformer capacity to actual demand on the feeders.

Complaints. The company has a very definite policy with regard to complaints, on the basis that good-will is created by

TABLE 4—LOAD AND VOLTAGE READINGS

	Number	Per Cent
Feeders covered by test (central division)	40	
Transformer load tests	2,623	
Found overloaded	112	4
Found underloaded	756	29
Found O.K.	1,755	67
Secondaries tested	1,742	
Found O.K.	1,412	81
Rearrangements required	330	19
Rearrangements ordered:		
Spans No. 6 changed to No. 2	810	
Spans No. 2 changed to No. 2/0	16	
New transformer installations	149	
Transformers relocated	55	
Transformers relocated and size changed	73	
Transformers changed at same location	155	
Transformers removed from service	16	
Primary rearrangements ordered	80	
Primary phase areas changed	15	
Feeder areas changed due to load and voltage conditions	13	

TABLE 5—VOLTAGE COMPLAINTS

	Number		Per Cent	
Voltage complaints checked (central division)	353			
Found justified	172		49	
Found voltage normal	181		51	
Reported high	157		45	
Found high		44		25
Reported low	72		20	
Found low		43		25
Reported fluctuating	124		35	
Found fluctuating		85		50

Summary of causes of justified complaints:

Overloaded primary	9	Wiring or appliances	9
Overloaded transformer	7	Regulator adjustment	21
Overloaded secondary	56	Transformer trouble	2
Overloaded service or premise	12	Wrong primary phase	10
Loose connections	27	Miscellaneous	14
Load unbalanced	5	Total	172

TABLE 6—RADIO INTERFERENCE

	Number	Per Cent
Radio complaints checked (central division)	309	
Electric service caused	64	21
Customer's appliances	45	15
Radio set trouble	71	23
Other utilities caused	15	5
Unfounded or disappeared	114	36

Causes of electric Service Interference:

Primary plug-type fuses	8	Arc lamp or circuit	7
Primary wood box fuses	2	Tree grounds	15
Primary porcelain box fuses	5	H. V. line discharge	9
Lightning arresters or conn.	4	Voltage fluctuation	4
Secondary trouble	6	Other causes	4
		Total	64

prompt and careful individual attention to all complaints made. High voltage complaints, a large percentage of which originate as excessive lamp burn-out complaints, along with complaints of high bills, have increased in recent years. This increase is not, however, chargeable to operating conditions. An analysis of voltage complaints received and the causes of the justified complaints for the central division is shown in Table 5.

In this summary voltage fluctuations due to refrigerator load on secondaries are classified as due to "overloaded secondary lines" and the loose connection causes include service entrance switch connections. It is interesting to note that about twice as many high voltage complaints were received as low voltage, but the justified complaints were equal, high and low.

Comparing the four divisions of the system on the basis of complaints received per 1000 residential and commercial customers show: 2.3 for the central division; 1.4 for the other division included in the central operations; 4.2 each for the other two divisions which do not have the periodic check of voltage control as do the first two divisions. It has been found that the periodic field check locates the low voltage and overloaded secondaries although it does not locate all of the fluctuation cases. The two divisions included in the periodic check had only 0.28 justified low voltage complaints per 1000 customers compared to 1.4 in the other two divisions.

Interference. Radio interference has been reduced steadily and the complaints received during the past two years have been only about one-third to one-half of what they were during 1928 and 1929. Interference from power equipment has reduced to even a greater extent, being about 25 per cent as much in 1933 as in 1929. Only 20 per cent of the complaints received were found to be due to power causes, but here again good-will and customer relations justify a liberal policy in investigating all complaints which are made. It is estimated that the inspection costs represent about one-half of one per cent of the revenue from radio usage.

Work which has been done for other reasons has helped, incidentally, to reduce radio interference. The change in primary fusing, mentioned in a previous paragraph, is an example. Interference from this cause reduced from 121 in 1930 to 15 in 1933, 8 of which were due to the plug-type boxes which are being removed from service as fast as economical. Another angle to this inspection work is that many of the power cause interference cases would later develop into more serious trouble. Radios locate troubles, such as loose connections and faulty equipment, in their initial stages.

Conclusions

Reliability of electric service is something most of our customers take for granted. Never failing service seldom gets its share of praise, but it should be advertised along with the low cost of using appliances.

A possible improvement of availability, or continuity of service, and of general service conditions, warrants a close study of present operations. Inspection of individual causes of trouble, classification and comparison, and careful study of a periodic review of the tabulations, are justified in the interests of service. It is suggested that this activity deserves as much of managerial attention and interest as would be given a major system disturbance.

Consistent operation requires a degree of attention to small units, such as transformers hung on the line, comparable to that given to the larger units in substations and power plants. While 10 or 20 thousand line transformers cannot be inspected and checked for condition and load as often as are 100 or 200 substation transformers, some periodic and regular routine should be followed to locate weak spots before they develop into troubles.

Considerable benefit could be derived from an exchange of operating records, such as given here, among various companies. Variations in load density affect density and size of installations and exposure to lightning and other weather conditions to a considerable extent. Further study may be necessary to arrive at a basis of comparison and classification to fit local conditions.

Canadian Electrical Association Convention

By B. C. FAIRCHILD

The Forty-fourth Annual Convention of the Canadian Electrical Association was held on June 13, 14 and 15 at the Log Chateau, Seigniory Club, Quebec, at which there was an attendance of 309. This is a record for all time, the previous high attendance being in 1929, when the convention was held at St. Andrews, New Brunswick, with 284 delegates registered.

President Alex. D. Robb in his address pointed out that in March, last, the all-time high record for consumption in Canada was reached with a total of 1,795,616,000 kwhr.

Mr. Robb referred to the rapidly growing tendency throughout the world toward the socialization of industry and government ownership and control of business. He said that the first reason for this condition is the ignorance of the public, who are our customers and who are also the voters, with regard to matters electrical; the second, the lack of effort on the part of the utilities to educate the public as to the value of our service, and third, to the policy on the part of many utilities in thinking that adequate service is rendered when service wires are run to the customer's house.

We should look beyond this, said Mr. Robb, and see that interruptions are reduced to the very minimum; do everything possible to maintain service while properly and courteously educating our consumers to the difficulties of our business and of the great value of our service to them. The selection of proper employees for customer contacts, their education in the utilities' problems and their training will do wonders toward overcoming the growing tendency to persecute the utilities, he said.

Papers presented during the sessions were as follows:

"Compensating for Rate Reductions"—An outline of the methods by which one of the largest Canadian utilities has increased its load to a very substantial degree.

"Recent Developments in Light Sources"—A demonstration talk covering new lamp developments and uses.

"The Century of Progress Exhibition Lighting"—A demonstration talk of the fair last year and plans for this year.

Each morning was fully occupied by section meetings, which were well attended and responsible for some valuable and interesting discussions.

Entertainment features included a clam bake, swimming party and fashion parade and many other items.

Proceedings of the convention will be published and available about September 10th.

Byllesby Prize Paper

HOW TO INCREASE THE USEFULNESS OF THE ACCOUNTANT IN THE ELECTRIC LIGHT AND POWER INDUSTRY

By H. A. WARDENBURG

Accounting is a science, a knowledge of which gives one an insight into the mechanism of corporate life; properly applied, it gives one a knowledge of the past life, the present status, and with a proper correlation of these two, an insight into the future of the corporation. It is as a microscope, when properly focused, pierces through the outer surface and lays open the whole intricate intercorporation network. It gives an instantaneous view of the corporation's revenue circulating through the organization, giving life to its individual parts, and returning to its central reservoir—the surplus account.

It is a function of the accountant to so picture this flow that management will know that the individual parts are each given their proper proportion of the revenue, that there is neither skimping of one part nor waste on another, yet with enough left over to be used again, to supplement a possible decreased revenue flow in later years—or to be used to give life to the increased size of the parts resulting from the corporate growth. Another function of the accountant is to compile the fixed capital and liability accounts to the end that the balance sheet will be correctly stated. Balance sheet and profit and loss statements are the summation of the accountant's efforts for the year and are worthy of more than a glance. These statements can become quite voluminous, and comparisons over a period of years become very difficult of proper interpretation. The accountant's usefulness can be increased by a proper analysis, interpretation, and presentation of the related items in the statements which he has prepared, so that management can obtain a concise financial picture of the Company.

How can this picture be best portrayed? Before an artist makes a picture, he decides on the things he wants to place in the picture, and then determines their perspective. The accountant, too, will have to decide upon what he will show in his picture. There are many possible things to reflect, but the accountant's skill and his usefulness to the industry depend upon his choice of elements—his judgment in bringing out those relationships or ratios in the profit and loss statement and the balance sheet that are pertinent—those relationships that can be used as guideposts for management—guideposts bearing explicit directions that will inform management as to the course and destination of the Company's business. Then the perspective must be determined—Will it be an historical perspective, one showing the present status, or will it be a combination of both—to the end that the picture may be carried farther into the future.

Mr. Wardenburg is the winner of the 1934 First Byllesby Prize. Mr. Wardenburg was born 1906 in Douglas, Ariz. After attending the University of California at Los Angeles for two years, he entered the service of the Commonwealth Edison Company in February, 1926. He graduated from the Northwestern University School of Commerce in 1929, and is now preparing his thesis on Public Utility Management for his Master's Degree. Mr. Wardenburg is a Special Budget Clerk in the Budget Bureau of the Commonwealth Edison Company, Chicago, Ill.

The accountant's usefulness can be further enhanced by his skill in the selection of a base by which the relationships or ratios he has ferreted out may be compared. Will the base be other companies' standards, the average of the industry? If so, he will need to use careful judgment, for there is the possibility that such comparisons may lead to widely-diffused results and become meaningless because of the divergence of the financial set-ups and policies of the companies, because of their affiliation or non-affiliation with holding companies. Under such conditions, to decide what company's ratios are the more favorable becomes impracticable. As a matter of fact, there is no average utility company. It is impossible to judge runners by the fact that the time of 1000 men running 100 yards is 15 seconds. However, we might use Charley Paddock's best time of 9.6 seconds as a standard. The accountant, then, can analyze the financial statements of his company over a period of years to determine what it has been capable of doing in the past, whether its present performance measures up to its past, and what it will likely do in the future.

The results of good or bad management are ultimately reflected in the balance sheet, there to stand as commendation or condemnation of management's efforts. The economic and operating conditions responsible for the company's earning power are reflected in the profit-and-loss statement. The accountant, by the very nature of his work—his daily, direct contact with the primary data—has built up the figures reflected in these statements. Who, then, is in a better position to consult with management as to their significance? Possibly one of the most satisfactory methods of engraving upon the mind the significance of the items in these statements is by means of the ratio or logarithmic chart. However, it would better be called "ratio chart," for most executives fight shy of the word logarithm. To their minds, a logarithm connotes something ultra, mysterious, technical—Unpleasant recollections of school-day perplexities, hazy impressions

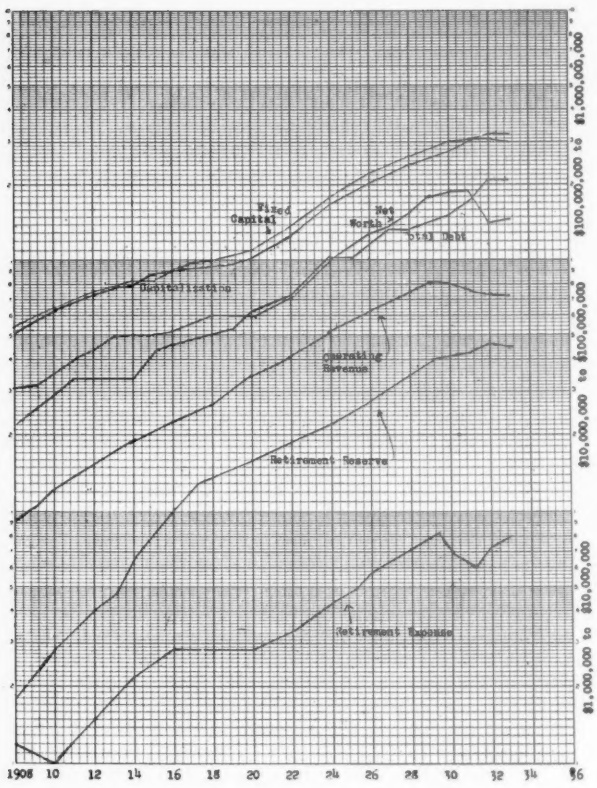


Fig. 1—Ratio graph showing relative changes in financial statements over a period of years

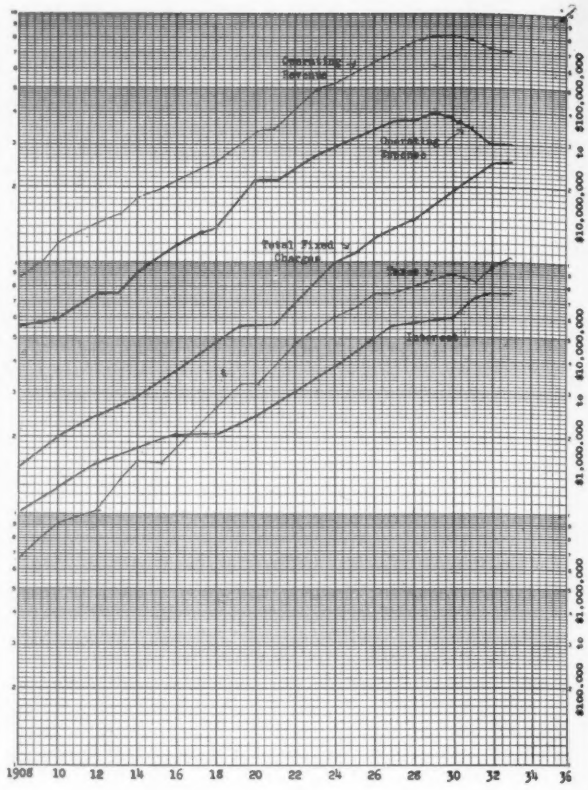


Fig. 2—Ratio graph showing relative changes in financial statements over a period of years

Table 1

	RATIOS PERTAINING TO INVESTMENT IN FIXED ASSETS			RATIOS PERTAINING TO STOCKHOLDER'S EQUITY				RATIOS PERTINING TO PROFITS					
	1	2	3	4	5	6	7	8	9	10	11	12	13
	Dollar of Fixed Capital per $ of Oper. Revenue	Revenue to Net Worth	Net Worth to Fixed Capital	Bonds to Fixed Capital	Bonds to Total Capitalization	Retirement Reserve to Fixed Capital	Net Worth to Total Debt	% Operating Expense to Revenue	% Retirement Expense to Revenue	% Net Income to Revenue	Times Interest Earned	% Total* Expense to Revenue	%* Return on Fixed Capital
1908	$5.40	32	60	40	41	3	142	48	12	20	4.1	80	3.7
1909	5.40	33	56	43	45	4	122	45	10	22	3.9	74	4.9
1910	4.80	37	56	44	46	4	122	50	7	22	3.8	72	5.9
1911	5.00	35	58	46	47	5	118	46	9	23	4.0	72	5.5
1912	4.80	36	59	44	46	6	127	47	10	22	4.1	68	6.7
1913	4.60	35	61	41	41	6	141	47	9	24	4.5	65	7.6
1914	4.20	39	61	40	41	8	143	51	11	22	5.0	71	6.9
1915	4.00	41	60	48	46	10	117	50	12	22	4.7	69	7.7
1916	3.90	45	58	48	48	12	111	52	12	19	4.4	72	7.2
1917	3.80	45	59	44	46	13	117	54	11	18	4.5	74	6.9
1918	3.70	45	59	43	46	14	118	53	11	19	4.7	74	6.9
1919	3.30	52	59	47	48	15	110	56	10	16	4.8	78	6.6
1920	3.10	59	55	48	50	15	96	63	8	13	4.0	81	6.1
1921	3.20	57	55	49	51	14	96	58	8	14	4.0	78	7.0
1922	3.00	61	54	46	50	14	96	59	8	14	4.0	80	6.8
1923	3.15	59	54	49	51	13	97	57	8	15	4.8	77	7.1
1924	3.40	54	54	50	52	12	97	54	8	17	4.3	75	7.3
1925	3.35	52	58	46	48	13	111	54	8	18	4.5	74	7.7
1926	3.40	52	59	48	48	13	109	53	9	19	4.5	73	7.7
1927	3.50	52	57	49	50	13	102	54	9	19	4.5	74	7.5
1928	3.60	49	59	46	49	14	115	51	10	20	4.8	72	7.9
1929	3.70	47	61	42	47	14	125	53	10	20	5.1	72	7.6
1930	4.10	44	62	43	48	14	123	54	9	20	4.8	70	7.3
1931	4.55	44	60	52	51	15	102	54	8	20	4.0	68	7.0
1932	5.00	50	47	57	52	16	70	52	10	14	3.0	72	5.6
1933	5.10	49	48	57	52	17	72	52	11	11	2.7	76	5.2

* Before interest and dividends.

of the "mantissa" and the "characteristic" are recalled, leaving them in a very unreceptive frame of mind. As no logarithms are involved in plotting or interpretation—the reference being to the fundamental governing the spacing of the rulings—it is better described by its functional process—its characteristic of portraying the relationships and rates of growth and change between items.

This type of chart is more informative than the rectilinear or arithmetic chart because it gives so clearly the percentage increments which is the significant part of business data. What does it matter if the Company has increased its revenue a million dollars when that represents, let us say, a 2 per cent increase over the preceding year when the normal rate of increase is 5 per cent to 7 per cent? Plotted on the arithmetic scale, this million would show up as an imposing gain. Plotted on the ratio scale, it is revealed instantly as a decrease in the normal or average rate of growth, and it is the percentage or rate of increase or decrease that tells the real story of the Company's progress.

The percentage fluctuations between years are readily ascertainable without resort to calculation, and a glance will show whether one set of data is increasing or decreasing too rapidly when compared with another set of data (curve), for equal changes in the slope of two lines plotted numerically indicate equal changes in their percentage. In order to determine the exact percentage change between years, a percentage indicator may be used. This indicator has the same spacings as the ratio paper and, when placed at zero opposite one point on a line, will give the correct percentage increase or decrease as compared with any other year.

The two graphs, Figs. 1 and 2, illustrate the important financial changes that have taken place in one company over the past 25 years:

How can these changes be interpreted? The changes in the relationships in these graphs are the important factors rather than the changes in amounts. To determine this relationship, the per cent or ratio of one item to another has to be determined. In analyzing changes in the ratios, it should be borne in mind that they may result from changes in either the numerator or the denominator, or both; so, it is always advisable to keep in mind the figures from which the ratios were calculated. By referring to the illustrative graphs, one can determine, by the slope of the lines, whether the operating ratio, for instance, went up

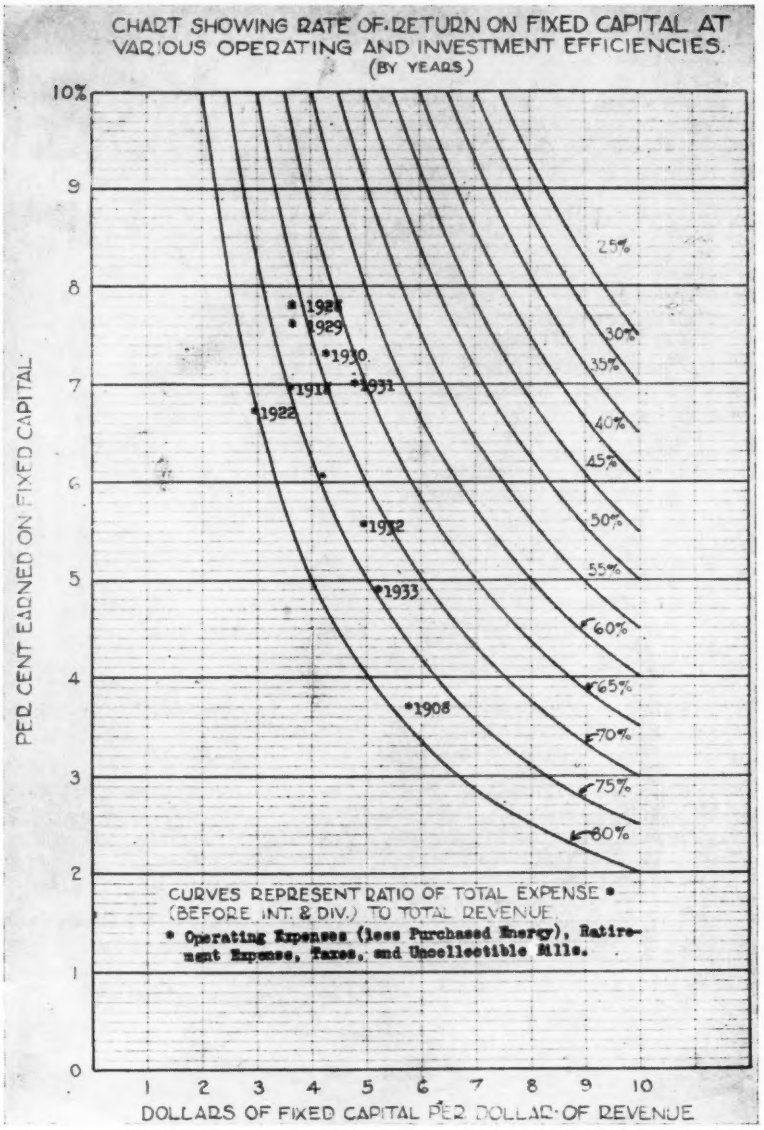


Fig. 3

because of an increase in operating expense, a decrease in revenue, or a combination of both.

The more important fact-revealing ratios determined from the figures on the financial statements are shown in Table 1. In order that conclusions as to their meanings may be facilitated, they are grouped to throw light on the following questions:

1. Has there been an over-investment in fixed assets?
2. Has the stockholder's equity been improving?
3. Have the profits been satisfactory?

The accountant, with his knowledge of the important changes that have occurred in the Company, from both the financial and the accounting viewpoint, can be of value in aiding management in their interpretation. An interpretation of these ratios is given below: Ratios pertaining to an over-investment in fixed assets:

1. Fixed Capital to Operating Revenue expresses the number of dollars of investment required to produce a dollar of revenue. This amount has varied from $5.40 in 1908 to a low of $3.00 in 1922. It has increased again from 1922. The ratio chart, Figure 1, illustrates this tendency, the spread between the fixed capital and operating revenue curves being less in 1922 than before or afterwards. To know the reason why it has increased, this ratio must be compared with the operating ratio, for possibly the low investment in 1922 was a result of inadequate and inefficient equipment resulting in higher maintenance costs. The effect of the investment and operating efficiencies

upon the net earnings from the investment will be discussed under the heading Rate of Return on Fixed Capital.

2. Revenue to Net Worth expresses the gross revenue produced per dollar of stockholder's equity. This ratio has increased up to 1922, indicating that the stockholder's equity has been increasingly more productive. From 1922 on it confirms the condition referred to in the first ratio.

3. Net Worth to Fixed Capital expresses the percentage of the stockholder's equity in the fixed capital. This ratio will also indicate the extent to which the capital stock and surplus are being invested in fixed capital or other than fixed capital—a high ratio indicating the former, a low ratio the latter.

Ratios pertaining to the status of the stockholder's equity:

4. Bonds to fixed capital expresses the extent to which the fixed capital is bonded, and reciprocally, the extent of the stockholder's interest in the fixed capital.

5. Bonds to total capitalization expresses the policy of the management regarding the financial structure of the Company, a low percentage of bonds indicates a larger stockholder's interest in the Company than creditor's interest. This ratio runs in conformity with the preceding one, bonds to fixed capital.

6. Retirement Reserve to Fixed Capital indicates the amount of earnings which have been set aside for reinvestment in plant and equipment. The higher the reserve, the greater cushion there is for writing off in the future equipment removed from service.

7. Net Worth to Total Debt expresses the proportion of the stockholder's equity in relation to the creditors. A 100 per cent ratio indicating that the stockholders' and creditors' equities are the same—over a period of years, it will indicate the type of financing which the Company is following, whether it is favoring bonds and notes to stock.

Ratios pertaining to profits are:

8. Operating Expense to Revenue (operating ratio) expresses the operating efficiency of the Company. A low ratio indicating low operating and maintenance costs. Such a condition may be due to a high investment resulting in high fixed charges, so both the operating and investment efficiencies should be correlated to determine the return on the fixed capital, as will be discussed below under "Rate of Return on Fixed Capital."

9. Retirement Expense to Revenue expresses the percentage of the total revenue which has been added to the retirement reserve during the year for the future replacement of equipment.

10. Net income to Revenue expresses the profits earned on the sale of electricity after all charges including taxes, but before interest and dividends.

11. The number of times over that the bond interest has been earned expresses the cushion in the form of reserve earnings that was available for the bondholders, and reflects the earning power of the Company.

Rate of Return on Fixed Capital

12. Total Expense to Revenue expresses the percentage of the revenue which has been expended on operating, maintenance, retirement, taxes and all other charges except interest and dividends. This ratio, when used in conjunction with the number of dollars of fixed capital invested to produce a dollar of revenue, measures the percentage return on the fixed capital.

The graph, Fig. 3, summarizes the results from operation over a period of years and enables the executive to visualize the earning possibilities at the various operating and investment efficiencies. The scale on the horizontal axis

(*Continued on page* 285)

ELECTRIC REFRIGERATOR SALES

HOUSEHOLD MODELS ONLY—SIX MONTHS 1934

	YEAR'S QUOTA	SIX MONTHS' QUOTA—64%	ESTIMATED TOTAL SALES	% QUOTA REALIZATION
New England Division				
Connecticut	19,243	12,316	13,685	111.1
Maine	7,899	5,055	5,163	102.1
Massachusetts	49,224	31,503	37,210	118.1
New Hampshire	5,095	3,261	3,388	103.9
Rhode Island	8,074	5,167	5,957	115.3
Vermont	3,305	2,115	2,002	94.7
Eastern Division				
Delaware	2,054	1,315	2,349	178.6
Maryland & D. C.	20,319	13,004	28,894	222.2
New Jersey	49,202	31,489	43,100	136.9
New York	154,788	99,064	128,009	129.2
Pennsylvania	86,678	55,474	94,875	171.0
East Central Division				
Kentucky	11,293	7,228	15,130	209.3
Ohio	64,710	41,414	70,359	169.9
West Virginia	7,970	5,101	14,751	289.2
Middle West Division				
Iowa	19,012	12,168	17,022	139.9
Kansas	14,127	9,041	16,656	184.2
Missouri	27,824	17,807	40,540	227.7
Nebraska	9,783	6,261	12,213	195.1
Pacific Coast Division				
Arizona	2,916	1,866	2,801	150.1
California	78,695	50,365	47,623	94.6
Nevada	714	457	939	205.5
North West Division				
Idaho	3,303	2,114	3,665	173.4
Montana	3,550	2,272	4,309	189.7
Oregon	10,010	6,406	13,440	209.8
Utah	4,863	3,112	4,955	159.2
Washington	18,025	11,536	15,187	131.6
South Eastern Division				
Alabama	7,187	4,600	11,953	259.8
Florida	9,790	6,266	8,216	131.1
Georgia	8,309	5,318	16,902	317.8
North Carolina	10,945	7,005	17,089	244.0
South Carolina	4,358	2,789	7,139	256.0
Tennessee	9,783	6,261	17,711	282.9
Virginia	11,031	7,060	16,910	239.5
Great Lakes Division				
Illinois	77,150	49,376	74,348	150.6
Indiana	28,271	18,093	26,539	146.7
Michigan	44,387	28,408	40,856	143.8
Wisconsin	26,180	16,755	17,300	103.3
North Central Division				
Minnesota	19,794	12,668	14,298	112.9
North Dakota	2,511	1,607	2,670	166.1
South Dakota	3,217	2,059	3,468	168.4
Rocky Mountain Division				
Colorado	8,420	5,389	8,397	155.8
New Mexico	1,388	888	1,992	224.3
Wyoming	1,311	839	1,856	221.2
South Western Division				
Arkansas	4,554	2,915	6,846	234.9
Louisiana	8,242	5,275	6,873	130.3
Mississippi	3,568	2,283	3,318	145.3
Oklahoma	10,531	6,740	14,791	219.5
Texas	26,903	17,218	39,880	231.6
Total	1,010,506	646,723	1,003,574	155.2

WELFARE WORK FOR PROFIT

Several years ago the anonymous author of this article left a power company to engage in welfare work. Knowledge gained in his new connection has given him a better appreciation of the work he did with his old company

(By Courtesy of Nation's Business)

I have spent a part of my life working for a public utility in the Southwest serving some 300 communities. Another part of it has been spent in the employ of a welfare organization laboring to feed and clothe and house the needy.

As I look back, I find a great deal to be proud of in both jobs. I find, too, that there were the same irritations in each. Petty politics aren't confined to public office or to public welfare work. You'll find them in private industry. To offset that, I've found a great deal of unselfish devotion in each organization for which I have worked.

But I am sometimes inclined to think that, if I measured my job by the standard of good done to the community, the work with the power company was at least as effective as that done in direct relief.

Both welfare agency and power company give service in the larger and truer sense. Each supplements the other in meeting human needs. My old company went ahead increasing the consumption of electricity, lowering rates, attracting and developing industries, creating employment, educating farmers and housewives in electrical efficiency, paying heavy taxes, contributing to every good community cause.

So far as I know, there is no arbitrary rule against investment dollars going partners with charity dollars. Certainly between the two quite typical organizations with which I have worked, the affinity is clear. They serve adjoining fields, arrive by different routes at the same objective of a happier, healthier social order.

Seeking New Markets

When we set forth 11 years ago to push rural electrification, do you suppose John and Charlie and Hillman and I barred the doors, drew the blinds and went into a huddle to plan how we could get the folks on the farms to sign contracts by trickery, so that we could rush in and grab the spoils?

On the contrary, we called in experts from the state agricultural college. We put maps in their hands. We asked them to help us designate 21 test farms, so we could find out the extent to which electricity would be profitable or unprofitable. These farms classified as general, poultry, truck, dairy, ranching and cotton.

We metered every operation, kept the farm books better than they had ever been kept before, absorbed whatever losses ensued, politely waived the profits. In the course of this pioneering we uncovered hitherto overlooked opportunities to save money and make money, explored new avenues of production and marketing, sounded out the legitimate uses and the limitations of modern farm equipment. We found farms of certain types, sizes and locations on which central-station current would be impracticable and perhaps ruinous. We published our findings. We wanted farmers everywhere, on or off our lines, to benefit.

In five years the number of our rural customers grew from virtually none to more than 4000. A professional "family case worker" would aver that innumerable lives were remade, inhibitions overcome, adjustments achieved.

Take the case of Emil Ledbetter and his brother, who had struggled ineffectually and more or less gropingly to past middle life. They and their grown sons toiled early and late. Their wives pursued an endless round of hauling water from the well, washing clothes, carrying stovewood, churning butter. Electricity —thanks to the discernment of our rural service department—was brought to the farm entrance.

It rolled up its sleeves and attacked many tasks: cooking, refrigerating, lighting, pumping, grinding feed, filling two 350-ton silos. Of course, the process was evolutionary. But today this farming enterprise is up in the big business class.

It is electricity, the output of the insidious Power Trust, that helps to justify the silos. Penciled notes in my possession give this farm as an outstanding example of what can be done in fattening beef steers for the spring market. The fall before my inspection of this farm 320 head of Hereford steers had been purchased by the Ledbetters at $11 per hundred pounds. They were fed during October, November, December, January and February, and sold on the Kansas City market early in March. The 320 steers had increased in weight 108,000 pounds, or an average of 337 pounds per steer. They sold for $13.25 per hundred, netting a gross profit before deduction of expenses of approximately $18,000.

All of the feed was produced on the farm: 640 tons of sorghum cane silage, 2500 bushels of ground ear corn with the shuck on it; 72 tons of prairie hay and 110 tons of cottonseed cake meal received in exchange for cotton seed grown on the farm. The actual cost for feed, at fair market prices, was $8,450. The Ledbetters found that marketing their produce in hide containers was worth while.

Convenient Power

Of course, they could have used some other form of power for grinding the feed and filling the silos, but it happened that electricity, being "right handy" and not too expensive, gave them the idea—and from this idea developed other ideas. Today they have three automobiles, a tractor, well-painted barn and fences, a home that affords easy, comfortable living. The girls have time for picture shows and parent-teacher meetings, and last summer, I am informed, both families visited Chicago's Century of Progress.

These veterans in farming had within themselves the requisites for success: It merely took the throwing of an electric switch to touch them off.

No form of rural enterprise lends itself more spectacularly to the uses of electricity than dairy farming, unless it be poultry-raising. It is difficult to understand how anything as reputedly wicked as the Power Trust could be mixed up in a business which means strength to the invalid and life itself to millions of rollicking babies.

Here's what I know: Only good cows

are deserving of electric conveniences. An electrified dairy, properly managed, means better sanitation, lightened labor, and a fair living for the owner.

Our company's territory, because of its favorable soil and climate, the character and enterprise of its farming population, and a promising nearby market, lent itself admirably to dairy exploitation. Milk routes followed right along behind the rural electric lines.

We persuaded cheese factories and milk condenseries to come hither. This might be reprehensible because it meant that we sold that much more electric current to run their machinery. But it did bring a measure of prosperity to thousands of struggling farmers, and it abolished much of the drudgery of olden days.

Farming by Electricity

Many a dairyman on our lines was able to double his herd without adding to his milking time. Arthur Lake, for instance, did well to milk 20 cows before the coming of electricity. He took on a force of fast-working electrical hired men and found he could milk 55 bossies in an hour and a half.

Sam Galligher was a general farmer living a piece down the road from Lake. Electricity, in his case, made the difference between general farming and small dairying. He has 30 fine Jerseys and a weekly milk check.

I suppose there must have been something dark and treacherous in our foisting electric milk cooling, water pumping and milking machines on all these people, but some way I can't help thinking happily of the backbreaking labor saved, the comforts and conveniences brought to homes, the new outlook opened to families. And then, there's the health, sanitation and nutrition angle to consider.

Female welfarists get all excited about teaching scientific baby-washing to women who have to tote the bath water from the barnyard and heat it over a wood stove in the kitchen. It seems to me that they should pop their stays in a frenzy of joy at mere mention of modern bathrooms, running hot water and other manifestations of the civilization wrought by the electric wand.

I don't know what NRA has since done to poor biddy whose working hours and egg-production we greatly increased by electric lights turned on an hour or two in the morning and another hour or two at night. But I do know we strove in the cause of ease and efficiency when we campaigned to sell time-saving, labor-saving devices to several thousand "Mrs. Stephensons" of town by direct, personalized mail.

Sure, it was a racket. Slick, high-powered advertising. Just the infamous sort of thing you might expect from a management intent on earning an interest on its investment.

We went about our task with diabolic cunning (just as the organization I am now with goes about our periodic drives for charity funds). We carefully hand-picked our lists for the housewife with a husband making $3,000 or better a year; the kind who entertains at bridge luncheons, who is in need of all the leisure she can get for civic and community interests. Quite a typical modern, capable, versatile American woman with a young husband to help make good in the world.

This wholesome young woman became the object of 12 months of thoughtful maneuvering. We sent her artistic booklets with her own name, "Mrs. Frank J. Stephenson," nicely printed on the covers. We wrote her chatty, informative letters that sounded mighty personal, telling her the advantages of electric hair curlers, refrigerators, vacuum cleaners, percolators, toasters. . . .

Skip the melancholy details. In the end we "got" her—got her good—made something of a record unloading appliances on our chosen victim.

Strange to say, our salesmanship was so effective that "Mrs. Stephenson" remained sold, satisfied. Her husband imagined her younger, prettier, more interesting, because she kept physically fresh, rested, with time to read and visit and "keep up" with the swift-moving world.

Welfare Work Is Limited

Now, the usual welfare agency necessarily limits itself to those of us in dire need. It can hardly be concerned with what happens to "Mrs. Stephenson." And yet, what happens to "Mrs. Stephenson" has a mighty lot to do with what happens to the community, because she is the younger mother, the department store patron. Often, she is something of a welfare person herself, a chief resource of local social service, a worker —given time—on behalf of the underprivileged.

It seems to me it is mighty lucky that our old power company remained in the good graces of "Mrs. Stephenson" and her crowd, for you know we had to keep right on rubbing elbows, willy or nilly. We couldn't just tuck our franchises, our generators, and our distributing system under our arms and steal away in the night. We had to keep right on neighboring.

We were certainly not a settlement house, but neighboring was one of our principal diversions. Our stock, preferred and common, was quite alarmingly distributed among manual laborers, teachers, doctors, lawyers, clerks, merchants, housewives and salesmen of the region. We considered good neighboring to be good business. Whatever would raise the living level, boost agricultural and industrial revenues, wipe out poverty spots, provide safety and security, was to the benefit of our customer-capitalists.

We put on a drive for textile mills. We spent a portion of our gains to place our advantages before some of the key men in the East. We financed an inspection trip of executives and technicians.

Encouragement for Employees

We got some mills. Not all of them used our power. But strangely, they did all seem to take an interest in their employees — encouraged them to own homes, to maintain gardens, to be human beings rather than automatons. Like the employees of our power company, they were permitted to buy stock, to become part owners, with a voice in the management, a share in the profits, a personal pride beyond their own spoolers, looms and weekly wages.

Our turbines were fueled by coal, gas, oil, lignite. Running top speed, they became big consumers as well as producers. We purchased copper, poles, machinery, adding machines, lumber, typewriters, advertising space, stamps. We went aloft with electric riveters, below with electric drills. We made work for stenographers and filing clerks, bank tellers, brakemen, mechanics ten, twenty, a hundred, a thousand miles away.

We were "in" on nearly everything, even to such intimate concerns as hemming the baby's diapers on an electric sewing machine, pasteurizing his milk, warming his bottle in the middle of the night, refrigerating his formula, taking him by trolley across town to see grandma, washing, ironing his rompers, broadcasting his bedtime story. Our invasion of the home was unquestioned, if not exactly odious. There didn't seem to be any way to avoid it if we were to go through with our mission of full service.

Though we functioned as adrenalin in the heart muscles of the community, we did it with the entire approval and cooperation of our patient. And whenever we found the immediate supply of adrenalin to be insufficient, we had a whole system of storehouses to draw

Missionaries of Light—A group of new Home Lighting Advisers of the Tennessee Electric and Power Company, photographed at a recent Home Lighting Conference held at Chattanooga

upon. I can readily see why we were able to do so many things in the way of community doctoring that would have been beyond reason for the small local or municipal plant working by itself.

Enlightened social workers do what they can to foster self-respect and self-reliance. As against outright hand-outs, they much prefer "made" work.

Of course, they didn't originate the idea, I don't know who did. But I do know that years ago, before the need became so desperate as recently, my old company conducted painstaking social-economic surveys along its line. It took note of community resources, set industrial engineers and research men to work. It checked and rechecked its findings. Carefully avoiding ballyhoo, it undertook to build quietly, methodically, soundly, permanently. Came brick kilns, foundries, grain elevators, leather factories, millinery shops, cement plants, hospitals and sanitariums, automobile assembly plants, farm implement factories, a long category—"made" work that stayed "made." As a consequence, sheaves of salary checks and wages went each Saturday into houses, groceries, gasoline, clothing, education, babies, furniture, recreation, insurance.

My eyes are those of a welfare worker. They particularly approve *intelligent* friendliness. I maintain that the sort of thing my old company did was not merely well intentioned but was generally constructive. Even without my power company background, I would count myself blind and ungrateful were I not to praise the vision and efficiency which have saved us that additional depression burden.

My eyes are those of one who occupies an orchestra seat at the theater of life. Before me daily pass the happy, the poor, the needy, the disconsolate, the petulant, the discouraged, the broken, the struggling, the down-and-outers, the once-were's—brave actors and timid ones. If one had no inherent sense of adventure, no imagination, no patience, no abiding faith in mankind, it is hard to see how one could sit through the epilogue—at times so drab, so primitive, but always and eternally so worth while.

There are individuals without these leavening qualities: Dull, smug, myopic sales managers, statisticians, social workers, load dispatchers. They are nearly everywhere.

But it wasn't that kind of person who searched the wilds of India, Africa and South America until he found the exact bamboo fiber required for the filament of the early incandescent bulb.

Nor was it a timorous spirit that pushed the lights out into a certain crossroads of the Southwest, enabling 'possums to see to eat persimmons at midnight—and heralding the approach of the new era.

There was nothing regressive about the trail-blazing pioneer who put bulbs to blazing on a frontier courthouse square and stampeded a herd of longhorns.

When I think of the electric industry, I think of loyal souls like Arthur Ollman, vice-president, who lost his arm one blizzardy night helping a trouble-chasing crew of linemen.

I think of Mathew Orm, chairman, who adjourned a directors' meeting to place a deserving laborer in a job.

I think of President Elwood Brown, lover of horses and dogs, philanthropic in an unosentatious way, who ingerminates every worthy mustard seed with mountain-building faith.

I think of great laboratories where skilled chemists, physicists, mathematicians and electricians create more comfort and happiness for tomorrow's better world.

I think of the industry's program-planners bent over their maps, charting modes of living that will eliminate much of the misery seen by the relief agencies of today.

I think of a field in which scores, hundreds, thousands of keen-minded young men find useful careers—a field of achievement, adventure, romance, the substantial satisfactions and rewards of life. And yet—

Our social workers come back from isolated regions, to report that some folks still believe that goat's milk will produce hair, that the way to cure a child of whooping cough is to drop it into a grain hopper at the miller's and that the amulet is effective against the evil eye.

When my old company first brought electricity to help out the moon and the stars in the cow country, it was suspected that it would cause tornadoes and mess up the weather generally. Ranch men and villagers accordingly viewed its advent with awe and alarm.

We are not entirely rid of the witchcraft and hexing of the Dark Ages. The very person who ridicules the superstition that three drops of blood from a black fowl will cure convulsions may be the one to charge that there's a hobgoblin in every electric transformer box.

BETTER LIGHT-BETTER SIGHT BUREAU

Organized Aug. 1st on National Cooperative Basis

Organization of the Better Light-Better Sight Bureau as a voluntary, non-profit, educational, social service, and market building enterprise on a co-operative national basis to function for all interests and associations allied in promoting eyesight conservation was effected on August 1st at a meeting held at the Westchester Country Club, Rye, N. Y. The new organization supersedes and will enlarge on the work of the special committee of the Sales Committee of E.E.I., which originated and sponsored the Better Light-Better Sight activity of the past year.

Mr. M. E. Skinner of the Niagara Hudson Power Corporation, who was chairman of the special E.E.I. committee promoting the Better Light-Better Sight activity, is chairman of the newly organized bureau. Mr. M. J. Julian, president of the Better Vision Institute, is vice-chairman. The executive committee consists of Messrs. H. F. Barnes of General Electric, J. F. O'Brien of Westinghouse and C. E. Greenwood of E.E.I. Mr. G. R. Trumbull is manager of the bureau with headquarters at E.E.I. offices in New York.

Eleven national trade associations linking twenty-one groups interested in eyesight conservation and lighting sales were officially represented at the organization meeting.

The Bureau, through its allied membership, will concentrate its efforts toward bringing about a greater public realization of the value of good eyesight and necessity for better seeing conditions. The Bureau is now actively studying ways and means of developing extensive promotional, advertising and sales programs as a central bureau operation and, more specifically, within the membership of the various groups and associations.

Organizations endorsing or participating in the formation of the Better Light-Better Sight Bureau were:

Better Vision Institute.
National Paint, Varnish & Lacquer Assn.
National Clean Up and Paint Up Campaign Bureau.
Artistic Lighting Equipment Assn.
National Electrical Wholesalers Assn.
Illuminating Engineering Society.
National Retail Dry Goods Assn.
National Retail Hardware Assn.
National Retail Furniture Assn.
National Electrical Manufacturers Assn.
National Bureau of Casualty & Surety Underwriters.
Edison Electric Institute.
The Illuminating Glassware Guild.
Mazda Lamp Manufacturers
Save the Surface Campaign.

Presentation and discussions of the plans and programs of several of the groups in directly tying in with the Better Light-Better Sight movement occupied the major portion of the organization meeting.

Those taking part in the meeting were:

M. J. Julian, President, Better Vision Institute.
R. W. Emerson, Executive Secretary, National Clean Up & Paint Up Campaign Bureau.
J. Markel, President, Artistic Lighting Equipment Association.
E. A. Hawkins, representing National Electrical Wholesalers Association.
A. L. Powell, President, Illuminating Engineering Society.
Wm. C. Macey, representing National Retail Dry Goods Association.
R. J. Atkinson, representing National Retail Hardware Association.
J. B. McMahon, Jr., representing National Retail Furniture Assn.
Albert Whitney, representing National Bureau of Casualty Surety Underwriters.
M. Schwarz, representing Portable Lamp Section, National Electrical Mfrs. Assn.
Guy P. Norton, representing Industrial Ltg. Section, National Electrical Mfrs. Assn.
K. Curtis, representing Commercial Lighting Section, National Electrical Mfrs. Assn.
J. C. Dallam, representing Wiring Devices Section, National Electrical Mfrs. Assn.
H. N. Otis, representing Flexible Cord Section, National Electrical Mfrs. Assn.
Clarence Davis, representing H. F. Barnes of Incandescent Lamp Division, General Electric Company.
J. F. O'Brien, representing Westinghouse Lamp Company.
M. E. Skinner, representing Edison Electric Institute.
C. E. Greenwood, representing Edison Electric Institute.
G. R. Trumbull, representing Edison Electric Institute.
T. L. Blanke, Mdse. Mgr., National Retail Dry Goods Association.
John J. Hines, Jr., Executive Secretary, Portable Lamp Sect., NEMA.
C. J. Kreiger, Executive Secretary, Flexible Cord Section, NEMA.
R. L. Van de Vate, Bausch & Lomb Optical Company.
J. B. Lueck, Bausch & Lomb Optical Company.

Promotional campaigns with literature to be distributed to participating groups are now being prepared on an extraordinary scale by General Electric, Westinghouse and National Clean Up and Paint Up Campaign Bureau together with comprehensive publicity programs.

Utility Companies Active in Running Water Campaign

August 1st marked the start of the Electric Water Systems Council campaign to sell 125,000 electric water systems during the next fifteen months, ending on October 31, 1935.

This period covers three natural sales seasons for this type of equipment as follows:

August 1 to October 31, 1934
February 1 to April 1, 1935
August 1 to October 31, 1935.

A large number of electric utilities having rural customers have been quick to grasp the sales possibilities of a concerted drive on the part of dealers, jobbers, manufacturers and power companies to develop this business and have already ordered large quantities of promotional material from the Council to assist them in this work. An attractive broadside in color has been prepared for distribution to the prospect and an eight page plan book gives the details of the campaign. Other material which the Council has made available is a window seal (16 in. in diameter) and two sizes of electros of this seal suitable for use on letterheads or with newspaper or direct mail advertising. Additional information may be obtained from the Electric Water Systems Council, 420 Lexington Avenue, New York.

1934 National Electrical Exposition

The second annual combined National Electrical and Radio Exposition will be held for a period of eleven days, Sept. 19-29, inc., in the mammoth Madison Square Garden, New York City.

THE NEWER APPROACH TO THE LIGHTING PROBLEM

The Utility's Part in Better Light-Better Sight

By C. E. GREENWOOD

Commercial Director, Edison Electric Institute

The first year of any national promotional program establishes it as a success or failure. Performance is what counts, and we may therefore happily record the BETTER LIGHT-BETTER SIGHT Program as one that has taken root with widest and most comprehensive appeal, and one which merits sustained support.

Commercial Managers attending the Convention of the Edison Electric Institute heard expansion plans by means of a spectacular radio presentation. Many top executives listened to the presentation with keen interest, and there were numerous expressions of enthusiasm and pledges of local support.

Now what does "expansion" mean? From the utility viewpoint, just this: We have broadened the objective of the Program, adding educational and social features to the commercial which were paramount before. Nationally we are taking into our counsel this year other groups who have a stake in a movement such as the BETTER LIGHT-BETTER SIGHT activity. It follows that in making the Program effective locally that all group activities shall include the same interests that were invited to join the National Bureau.

The utility, if it performs the function of leadership which it is its practice to do, will initiate immediately, and move forward, the educational and social aspects of this Program. It will open up new channels in which those whose interests are better eyesight, or better reflecting surfaces to aid in seeing, or adequate lighting equipment and accessories, may direct their educational and promotional messages. This background will aid the utility in vigorously handling sustained commercial promotion of more and better light. Manufacturer and dealer groups will do likewise.

The utility company sells a service to its consumers. It cannot afford to engage in any promotion which has not a constructive and worthy objective. It finds one of outstanding value in Eyesight Conservation in which its interest is fundamentally a duty. The Public must be told the advantages of adequate lighting and homemakers be convinced WHY they need more incandescent lamps, WHY they need higher wattage lamps, glareless light and scientifically constructed portables. The educational background puts the sale of light on a higher plane, and gives it a much needed permanency. There is such a sound reason for selling more lamps of higher wattages, and better designed light sources, that the utility would be remiss in failing to adopt an educational approach.

We must grant this is a much more expensive method of selling than just peddling material. That is, it will be so during the educational period. The effectiveness of the BETTER LIGHT-BETTER SIGHT Program from the viewpoint of the utility will be measured in terms of the reaction of the Public in the use of light after intensive promotional effort has ceased. An analogous case is the Food Preservation Program which was sponsored by the utility industry to make a Public temperature-conscious in connection with the protection of food in the home. The Program was convincing of the true value of adequate refrigeration, so that later when a Program was carried forward to sell a means of doing the job, the road for Electric Refrigeration to travel was much easier. And so now in the Lighting Program, we have the job of making the Public eye-conscious that we may sell better vision above the selfish motive of better light.

Response to the new approach to the lighting problem during the past year through visualization of lighting requirements on a meter dial, easily read by the novice, has been tremendously gratifying. Improvement in lighting already has been made in many a home, store and factory.

Add to this see-for-yourself method the science of seeing, and the practical aspects of eyesight protection, and we have educational tools of potential power in convincing a sceptical Public.

I would repeat that the selling process is expensive temporarily. We cannot give this message through a megaphone. It cannot be done on a "campaign" basis. Pitiless publicity, and damnable repetition will do its work well, but greatest results in permanency will come out of the individual, or at least small group contacts. This takes time. It takes man-power.

Women Lighting Specialists in the utility company have been increased three to four times during the past year. They have talked before small groups of customers and to the unseen groups by radio, and they have made many thousands of calls on the individual homemakers. Lighting Salesmen in the utility companies have been doubled during the past year. The number will increase, and these men and women will discuss the partnership of light and vision and what factors must be blended to get best results.

When the BETTER LIGHT-BETTER SIGHT Program was launched last year, suggestions were made as to how the utility might tie in with this national movement. There were included in the list of suggested local activities, educational work with employees and with the trades; the holding of lighting exhibits; group meetings with customers and lectures before clubs; liberal newspaper advertising and promotion including radio broadcasts.

The extent of coordinated and cooperative action by utility companies, manufacturers and others has been previously broadcast in the trade press and elsewhere. But it is of special interest to mention certain results from a survey to indicate the extent of utility participation in the first year of the BETTER LIGHT-BETTER SIGHT Program.

There are 985 cities in the United States over 10,000 in population and record was obtained of 734 or 74 per cent engaging in lamp and lighting activities. There were 462 or 47 per cent that operated home lighting campaigns, and 596 or 60 per cent operated commercial lighting campaigns. Stimulation of the national movement resulted in an increase of 15 per cent more lamp campaigns. Intensive sales effort resulted in the sale of approximately 350,000 wall brackets; 135,000 attachable fixtures and 78,000 of the new indirect portables. (*Continued on page* 282)

The Flying Scotsman

DINNER AT EIGHTY

By A. E. CLARK

Chef of the Flying Scotsman

Thousands of Americans touring in England and Scotland have enjoyed the food served on the Flying Scotsman. In this sketch, which is published through the courtesy of *Helios*, London, the chef of the world famous train, gives his opinion of electric cookery.

Mr. Clark has had twenty years' experience as a chef on the Flying Scotsman. He spends alternate nights in England and Scotland, and during the whole of each intermediate day cooks meals for approximately 300 passengers—in batches of about 78—as the great express travels at high speed over the 392 miles between Edinburgh and Kings Cross, London.

In the United States, the new streamlined high-speed trains of the Burlington and the Union Pacific systems are equipped with electric kitchens, as well as electric air conditioning.

I suppose there are not many kitchens as small as mine, and at all events they are not expected to produce meals on anything like such an extensive scale.

The working space in which I prepare a seven-course dinner and a six-course lunch for perhaps as many as 300 passengers is just 9 ft. by 6 ft. But I am always having to explain that cooking in a small kitchen is no hardship. In fact, in my own case I think I have a great many advantages over the average housewife of today.

For one thing, I don't waste a lot of time walking about dodging a kitchen table and chairs, and for another, all the cooking and cooling is done by electricity.

Whatever may be predicted for them in the future, many housewives of today would be envious of all the labor-saving devices of my small kitchen . . . particularly the refrigerator, in which the same electric current which is grilling chops or steaming a pudding a short distance away, is at the same time made to freeze pure water into blocks of ice, prepare ice creams and keep other dishes and bottles of wine in cold storage.

My advice to housewives is to cook by electricity when they can. The use of electric ranges is becoming more widespread, and soon there will not be the slightest excuse for hesitating, for the advantages are obvious to anyone who has tried them. I will explain for those who have not yet used them that they are very easy to manage. The food is much better cooked and keeps all its nutritive elements. The pots and pans, which, however, have to be made of a thicker and heavier material than the usual kind, are easy to keep clean. There are no difficulties in timing how long a thing must be cooked, or in judging the heat of the oven, for everything is clearly indicated, and it is only a question of one or two trial attempts to get to know the handling of the whole thing quite automatically.

In my traveling kitchen the whole equipment is arranged as conveniently as possible. I only have to glance at the large pilot lights—illuminating red glasses inscribed with the name of the apparatus in use—to know that the oven is, for instance, full on, the big copper kettle is just cool, and the grill is at "medium." Nothing could be more simple.

In addition, there is a large master switch overhead which controls the whole electricity supply, even to the huge tanks of water and washing up, which are being automatically heated in the roof, and the hot-plate cupboards with steel doors, in which piles of plates are put to warm.

A glance around my kitchen is enough to show that one cannot do better than take advantage of the improvements offered by science. The kitchen is kept at a more even temperature, electricity having done away with all the stuffiness, dirt and overheating which was always a problem under the old conditions.

Many kitchens are, of course, fitted up with every modern convenience today, but it seems to me that some women are slow to make the most of them. They do not always seem to realize that with a little more forethought and preparation they could get twice as much benefit out of a small but self-contained kitchen than is generally the case.

Cooking for a family cannot exactly be compared with catering on as large a scale as we do, but the principles are much the same and hints could perhaps be gathered from my experiences which might be adapted to household purposes.

The whole organization of the restaurant car is run very much on the same lines as in a hotel. The restaurant section carries a staff of seven or eight according to the passenger load. This consists of the conductor, train chef, kitchen porter and stewards. The cooking, carving and serving up are in my hands.

Every morning I obtain copies of the menus, make out my requisition sheets, and draw the provisions from the various storerooms—which are situated beneath the railway platforms at Kings Cross and Edinburgh. There is a complete butcher's shop, and also a grocery department where I get sugar, butter, eggs and everything I need. The stuffs are taken up by lift to the platform and so to the waiting train.

(Continued on Page 288)

NEWARK PROMOTES AIR-CONDITIONING THROUGH SUCCESSFUL SHOW

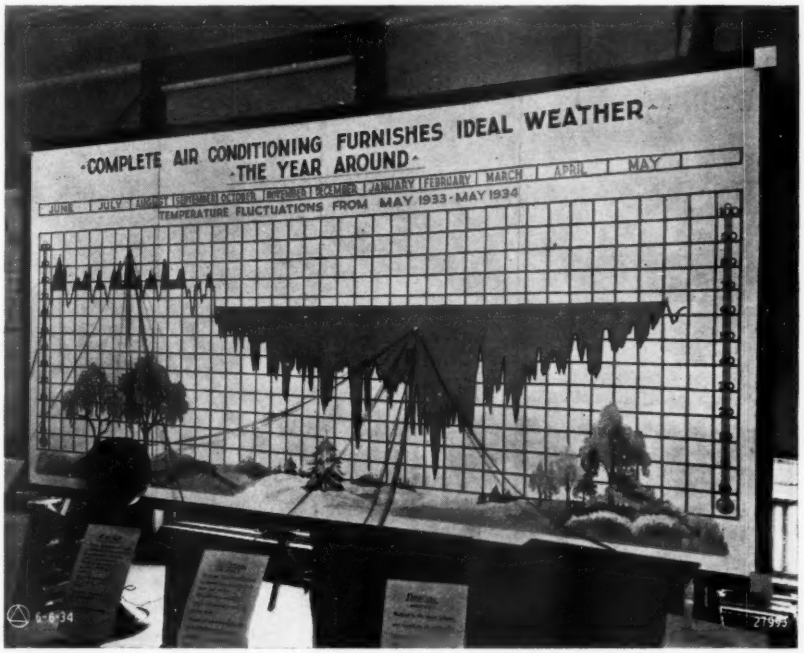
By H. P. MOREHOUSE

General Air Conditioning Representative, Public Service Electric and Gas Company

With the purpose of acquainting home owners, prospective home owners, architects, builders, plumbers, heating contractors, electrical contractors, owners of stores, restaurants, theaters, barber shops, and offices with the equipment available for air conditioning, a very successful air conditioning show, sponsored by Public Service Electric & Gas Co., was recently held in Newark, N. J.

The exhibit was advertised chiefly by a direct-by-mail campaign to selected groups. Invitations accompanied by two tickets to the Show were sent to approximately 65,000 persons. About 75 per cent of the invitations went to owners of better class single-family dwellings. These invitations were mailed during the week preceding the show. Tickets were also distributed through exhibitors, plumbers, heating contractors, service clubs, architect associations and company employes.

Publicity for the show was also secured through the medium of six newspaper advertisements. Three of these advertisements appeared during the week prior to the show and three during the week in which the show was in progress. News releases sent to local newspapers were also used to build up interest in air conditioning while the show was on.

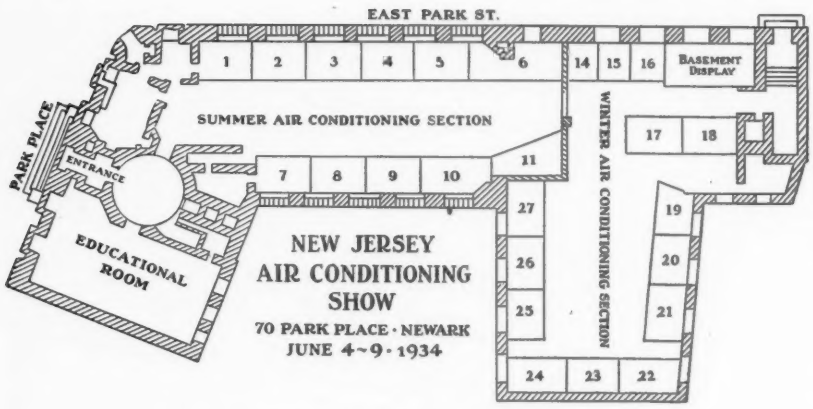

-COMPLETE AIR CONDITIONING FURNISHES IDEAL WEATHER-
-THE YEAR AROUND-
JUNE | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER | JANUARY | FEBRUARY | MARCH | APRIL | MAY
TEMPERATURE FLUCTUATIONS FROM MAY 1933-MAY 1934
6-6-34

This chart shows why air conditioning is needed the year round and what functions it accomplishes

View of part of summer air conditioning section of Newark exhibit, showing type of equipment displayed

The show was divided into two sections, one section being devoted to equipment designed primarily for summer air conditioning, and the other to equipment for complete winter air conditioning, and for automatic gas heating. This arrangement was made so as to keep certain types of equipment together and thereby avoid confusing visitors by showing a mixture of heating, cooling, humidifying, and dehumidifying equipment in the same or in adjacent booths. However, care was taken to show visitors, by means of educational exhibits, that the equipment for summer and winter air conditioning could easily be used together to do a year around air conditioning job.

The floor plan indicates the relative locations of the exhibits. The equipment displayed in the summer section consisted of self-contained and remote unit room coolers, store units, attic ventilating fans,



Floor plan of the Newark Air-Conditioning Show

ice coolers, suspended units and compressors of various types and sizes. Practically all of this equipment was in continuous operation during show hours. No attempt was made to completely air condition the display space, but the operation of the cooling units did keep this section reasonably comfortable.

The winter section was devoted to a display of complete, winter air conditioning systems, automatic gas burners, gas-designed boilers and humidifiers. All heating and humidifying equipment shown in this section was gas fired. Three displays of insulation and a display of storm sash and weather stripping also were included in this section. The Air Conditioning Department of Public Service Electric & Gas Co. advocates the installation of heat saving devices as advisable in automatic gas heating installations.

A small room, furnished as an executive's office was equipped with a cooling and dehumidification unit during the show to give visitors a sample of summer air conditioning. A one-ton unit was used for this demonstration.

A feature of the show which attracted considerable interest was an educational display containing the following exhibits:

1. A graphic analysis of what air conditioning is and why it is important in our daily life. This exhibit showed that the average person takes into his body about 2 lbs. of food, 4 lbs. of water and 32 lbs. of air each day; that he is most careful about his food to make certain it is fresh and pure; that he insists water be purified and treated to destroy germs, yet he consumes several times as much air as either food or water and does very little to assure himself that the air is properly treated.

2. A chart shown in an accompanying photograph tied in the functions of winter and summer air conditioning. It gave visitors some conception of the relative importance of the two and showed by actual equipment in miniature what was necessary at each season in order to enjoy complete control of the weather. A chart also showed the relative humidity found under average conditions. Two 40 quart milk cans full of water were used to impress upon visitors the surprisingly large quantity of water that is needed every 24 hours, to properly humidify a nine or ten room home during the cold days of winter.

One of the displays that attracted unusual interest was a comparative analysis of investment and operating costs for the various fuels used in automatic heating. The display pointed out what could be accomplished for approximately the same investment with gas, oil and coal.

A basement display demonstrated what could be accomplished toward modernizing a basement if a clean fuel such as gas is used. Duplicate cellars were used in the display and the treatment of the gas basement was attractive and novel.

An auditorium seating about 100 people was used throughout the show for special group meetings, and for the showing of talking pictures which traced the history of air conditioning from its early days to the present time.

One day of the show was set aside for architects and builders, who were urged to attend at a specified time to hear two speakers of national reputation. Attendance at this meeting taxed the seating facilities of the Auditorium.

At the entrance each visitor was presented with a large envelope showing a floor plan of the exhibition and a list of all exhibitors with their booth location. This envelope feature encouraged visitors to take home manufacturers' literature so that they could read it at their leisure.

A booklet entitled "Air Conditioning —What it is—What it does," was prepared and given out to each visitor. This booklet described the fundamentals of air conditioning in a simple non-technical manner.

A great majority of those who attended the show were "live" prospects for air conditioning. A number of sales were made from the show floor and the exhibitors obtained a great many excellent leads.

The food you eat is washed, the water you drink is purified, why not the same with the air you breathe?
Visit the NEW JERSEY AIR-CONDITIONING SHOW
See In Operation Machines Cooling, Cleaning, Humidifying, and Circulating the Air You Breathe
BECAUSE of the rapidly increasing interest in air-conditioning as an asset to business and added comfort and health to the home, Public Service, in cooperation with leading manufacturers in the field will conduct the New Jersey Air Conditioning Show at 70 Park Place, Newark, from June 4 to 9 during the hours from 12:30 to 10:00 P. M.
There will be on display at this exhibit many sizes and types of equipment for both summer and winter air-conditioning, some in actual operation.
Those who are interested in building up a larger volume of business during the summer months—and those who are interested in automatic control of the temperature and humidity of the air in their homes will have the opportunity of comparing the merits and advantages of the various systems applicable to the shop, store, office or home.
Tickets may be obtained from your local Plumber, Heating Contractor, Architect or Public Service Commercial Office
PUBLIC SERVICE

What about Air-Conditioning
OUR Home ?
WHEN the cave man first built fires to heat his cave-home—the first step of air-conditioning began. Until recently man's effort has been directed towards protection against cold air with no thought of correcting the hot humid air of summer.
Today not only can we automatically heat but we can cool, clean, humidify and circulate the air in our homes. And in consequence we can maintain a constant temperature and humidity in our homes, throughout the year.
Visit the New Jersey Air-Conditioning Show at 70 Park Place, Newark, June 4-9, and see air-conditioning equipment in actual operation.
NEW JERSEY AIR-CONDITIONING SHOW
under the auspices of
Public Service Electric and Gas Company

Types of advertisements used in promoting the show

NEW FEATURES IN INDUSTRY'S EXHIBIT AT CHICAGO FAIR

Jane Crandall with two of the puppets in a scene from the musical comedy "What a Night," which is presented in an air-cooled theatre as a new part of the electric light and power industry's exhibit this summer

One of the new features at the Electric Light and Power Industry Exhibit at the Century of Progress Exposition at Chicago this year is an air-cooled theater offering free entertainment where visitors may learn something about electric service in an amusing way while their feet are given a grateful rest. Marionettes, in music and verse, will demonstrate by their funny antics the conversion of a customer who thinks his electric bill is too high. Mr. Pettigrew, after sinking too much of the family finances in an unprofitable game of contract bridge, comes home to glare and swear at the electric meter for having, as he says, continuously robbed him of his substance. How he learned differently is the theme of the puppet comedy.

If the visitor saw the electrical exhibit last year he will find in addition to what was there then many new things to fascinate him. He will be able to try out on his own body the new fever machine from which the medical profession expects great things in the cure and alleviation of disease. Two of these machines are included in the exhibit. The home mechanics who last year gloated over the lathes, saws, drill presses and other machines designed for basement workrooms will this year have their covetousness more deeply stirred by seeing these machines in operation and a group of men turning out complicated whatnots of every kind.

All through the exhibit extensive revisions and improvements have been made. The industrial display of electrical heat, power, light and control applications, many of them in actual operation, has been enlarged. In the electric kitchen, on the electrified farm, and in the reduced scale displays of model operating room, school, retail stores and shops, all of the equipment has been refurbished and improved.

The principal feature of the exhibit, as last year, will be the impressive 90-foot diorama of electric service. In this great three-dimensional picture is shown the complete story of electricity supply, transmission, distribution and utilization. Coming down from the water storage lake high up in the mountains is the penstock of the high head hydro plant at the mountain foot. The water rushing down with tremendous force spins the Pelton wheel that drives the electric generator whose output is stepped up in the adjacent transformer station for transmission to the places of its use. Tied into the same transmission system is a low head water power plant farther down on the plain. These two plants send the bulk of their output to the city on the right side of the diorama, but some is taken by the mines and quarries of the mountainous region and by the prosperous farms of the countryside. The supply of electricity from the hydro plants is reinforced and added to by the steam plant in the city. Light and darkness on the diorama simulate night and day while lights come on in the homes, business places and streets of the city and twinkle across the country around. Movement of flowing water, of spinning

Mr. and Mrs. Henry Pettigrew, who have leading roles in the musical comedy marionette show "What a Night"

turbines and of transportation facilities animates the diorama and demonstrates in most graphic fashion the contribution to modern life of electricity, as well as its production, distribution and utilization.

The exhibit, as last year, occupies all of the semicircular second floor, a space of about 550 feet long, of the main electrical building of the exposition. Working models of basic devices and machines designed to show physical processes in the production of electricity again answer questions by demonstration as fast as they spring into the mind of the visitor. Flows of varicolored liquids in a simplified glass replica of a boiler show how water is turned into steam to drive power plant turbines. A large size section of a turbo-generator with wheels and rotor in full relief exposes the interior mechanism of this most important machine.

The utilization of electricity is still the major burden of the exhibit. There are six main divisions of the utilization display. They show severally the uses of electricity in commercial buildings, in schools and colleges, in hospitals and public health institutions, in various industries, in the home and on the farm. The greater part of these displays is of actual equipments and devices in full-sized installations, recourse to miniature presentations being taken only in necessary instances.

A complete set of farm buildings in model size showing the latest developments in design of such buildings gives an overall picture of farm electrifications. The details of this picture are filled in by displays of actual equipment to perform the many tasks to which electricity can be applied on the farm. In the list of displays under this head are more than thirty different electrical applications ranging from bug killing to silo filling. General illumination controlled by the photo cell or "electric eye," blackboard lighting for the conservation of child eyesight, and a demonstration of the use of talking motion pictures in education feature the model schoolroom. The hospital display, in which the uses of electricity in medicine and surgery are shown in a modern operating room, has been improved in several details. Five model stores show the most modern methods of lighting commercial places according to their specific requirements as well as the specialized uses to which electricity can be put in each. The theme of the commercial displays is the effectiveness of electricity as a salesman.

The industrial aspects of electricity utilization are again an important part of the exhibit. Most people think in only the vaguest sort of terms of the great strides that have been made in the past few years in industrial technique. They have heard of marvels, but have not actually seen them. Here they will have the opportunity to see, for instance, an electric furnace with a magnetic brain that controls temperatures more closely than any manual device might do, machines operated by the infinitesimal response of the "electric eye" to color changes or variations of shape. A few years ago, cast iron was cast iron, a brittle material of very restricted uses. The electric furnace changed that and now cast iron can be used for the strenuous duty of automobile motor crankshafts. Such a furnace is on exhibit, as are numerous other special applications of electric power, heat and light to specialized industrial processes.

The Newer Approach to the Lighting Problem

(*Continued from page 277*)

The trade press helpfully supported the Program. There were trade journals outside of the electrical industry that issued special lighting editions. Record has been obtained of 64 articles in journals within an approximate circulation of 864,000.

Approximately 1500 newspapers used editorial material on lighting and during the year eight articles of promotional value appeared in national magazines. These particular magazines have a combined circulation of 25,000,000.

Experience in previous national campaigns operated by utility associations indicates that every "national" dollar spent in advertising and promotion behind a mobilized industry program is matched from ten to one upwards in "local advertising and promotion. It was very much "upwards" in the first year of the Better Sight Program because our national funds were limited and even manufacturer advertising in consumers magazines had likewise been curtailed. But from reports received we estimated that approximately $250,000 was spent locally in the newspapers and $120,000 additional in utility direct mail advertising material. Some of the larger companies spent additional funds in billboard advertising to spread the BETTER LIGHT - BETTER SIGHT message.

The process of educating and correctly informing the Public starts internally. It is therefore gratifying to have record of 40 lighting schools held by the manufacturers for utility and dealer representatives last year with an aggregate attendance of 24,000, and of 1950 talks on lighting with an approximate total attendance of 59,000. And best of all, lighting personnel was increased by somewhat under 500 persons or approximately 75 per cent.

Nine issues of *Lighting News* widely circulated throughout the electrical industry have recorded outstanding accomplishments among the hundreds of utilities participating. The impressive thought from a review of such statistical results is the stupendous power of industry action with utility leadership.

Now as the electrical industry expands the sphere of its influence, and the Edison Electric Institute as utility sponsor invites major Professional and Trade Associations with a common cross-section of interest to join in a more comprehensive effort to sell Better Sight to the masses, there can be no question that the utilities stand ready to again formulate their local programs to coordinate with the National Bureau, and to cooperate among its local units.

Interest has been expressed by top executives of the utility companies in answer to a letter by Mr. Thomas N. McCarter, President of the Institute. It is somewhat amazing, though extremely gratifying, to have response from Commercial Executives in every section of the country, indicating enthusiasm in the preparation of Fall plans. Even now they are preparing for the "newer" approach to the lighting problem, and more money has evidently been made available, and programs have been more carefully and constructively worked out than last year.

The Division set up in the Commercial Department of the Institute to function for the Better Sight Bureau is indication of a sincerity of purpose. The Institute in conjunction with manufacturers has underwritten a promotional fund. We are now in action and fully confident that combined effort on the part of ten associations that have joined with us will result in common profit.

MEETINGS OF THE JOINT SUBCOMMITTEE ON DEVELOPMENT AND RESEARCH

The spring meetings on the work of the Joint Subcommittee on Development and Research were held on June 8 at the E.E.I. general office with the E.E.I. chairmen presiding. Mr. W. F. Davidson presided at the meeting of Division 1, which treats of subjects involving noise frequency induction, and Mr. A. E. Silver presided at the meeting of Division 2, which deals with low frequency induction and structural coordination.

Division 1—Noise Frequency Studies

The three project committees of this division presented reports on the progress of the work on their assignments during the past six months, and on work to be undertaken in the immediate future. A technical report was presented by Project 1A, entitled "Supplementary Factors for Estimating Noise-to-Ground from Magnetic Induction in Joint Use Cable Circuits." This report gives information for calculating noise-to-ground at vertical separations greater than the separations covered in Engineering Report No. 13. The project committee recommended that this be published as a Provisional Report and released generally.

Division 2—Low Frequency and Structural Coordination Studies

The six project committees of this division reported on the progress of their work during the past six months. Four of them also presented technical reports. Project 2A presented a technical report entitled "Studies of Higher Voltage Joint Use at Blackbird, Delaware." This report gives the results of a study made for joint use between a short section of 13.2 kv distribution line and an open wire telephone circuit. By the application of simple remedial measures the joint use between these circuits was considered mutually satisfactory from a safety standpoint. The project committee recommended that the report be accepted for the information of the Joint Subcommittee.

Project 2C presented Technical Report 2C-2, "Relative Cost Study for Distribution Systems in Nebraska Villages." This report gives the results of a study of the relative costs of construction in three villages near Omaha, Nebr., on the basis of 4000 volt joint use, 13,200 volt joint use, and 13,200 volt separate construction. This report is a companion report to Technical Report 2A-8, entitled "Relative Hazard for Distribution Systems in Nebraska Villages," which was presented at the December, 1933, meeting. The project committee recommended that this report be accepted by the committee for its information.

These reports, dealing with studies of specific problems, are, of course, sent to the cooperating power and telephone companies as a basis for the solution of their specific problems.

Project 2D presented three technical reports, namely, 2D-10, "The Effect of Vacuum Tube Amplifiers and Telephone Repeaters on Acoustic Shock," 2D-11, "Use of Copper Oxide Varistors in Reducing Acoustic Shock," and 2D-12, "A-C Type of Short Circuit Relay Protectors." The first two were recommended to be made Engineering Reports, and the third report was recommended as a Provisional Report. The report on a-c type of short circuit relay protectors supplements the previous report on short circuit relay protectors as the development work has shown that the a-c relay protector is more satisfactory than the earlier type.

Project 2K presented Technical Report 2K-3, entitled "Internal Impedance Characteristics of Copper Covered Steel Cables," with the recommendation that it be made a Provisional Report. This work was done since copper covered steel cables are frequently quite important factors in the shielding of circuits and satisfactory data on the impedance characteristics were not available. It is expected that the information contained in this report will also be of interest where this type of conductor is used for line conductors. The more important information contained in this report was published in a brief article on Page 32 of the May, 1933, E.E.I. BULLETIN.

The reports recommended for Provisional or Engineering Reports will be made available after such modifications as seem necessary have been incorporated, and upon approval by the Joint Committee on Plant Coordination. When the reports are available for general distribution announcement will be made in the E.E.I. BULLETIN.

E.E.I. AND OTHER WIRE USING UTILITIES JOINT COMMITTEES

In 1921 a Joint General Committee between the National Electric Light Association and the Bell Telephone System was formed for the purpose of studying the coordination problems affecting the facilities of the utilities represented by these two organizations. Later a similar committee was formed with the Western Union Telegraph Company, and in 1929 a similar committee was formed with the American Railway Association. These joint committees established a number of joint subcommittees for the purpose of carrying out the details of their assignments.

Following the formation of the Edison Electric Institute negotiations were opened with the organizations represented on these joint committees, in order to simplify the committee setup in accordance with the general committee policy of the Edison Electric Institute. As a result of these negotiations the former committees and subcommittees have been replaced in each case by two joint committees, i. e., a Joint General Committee and a Joint Committee on Plant Coordination for each cooperating organization. The new Joint General Committee in each case will deal with the approval and execution of agreements of the same kind as those hitherto dealt with by the former Joint General Committee.

The E.E.I. membership on each of the Joint General Committees is as follows:

A. H. Kehoe, *Chairman*, Vice-President, New York Edison Co. and United Electric Light and Power Co.; Paul M. Downing, Vice-President and General Manager, Pacific Gas and Electric Co.; H. P. Liversidge, Vice-President and General Manager, Philadelphia Electric Co.

This membership, which is identical with the membership of the Codes and Standards Subcommittee, will constitute the Communication Subcommittee of the Operating Committee of the E.E.I.

The Bell System representatives in the E.E.I.-Bell System Joint General Committee are as follows:

B. Gherardi, *Chairman*, Vice-President and Chief Engineer, American Tel. and Tel. Co.; F. B. Jewett, Vice-President, Am. Tel. and Tel. Co.; E. F. Carter, Vice-President, Am. Tel. and Tel. Co.

The Western Union representatives on the E.E.I.-Western Union Joint General Committee are as follows:

E. Y. Gallaher, Vice-President, Contract Dept., Western Union Tel. Co.; F. E. d'Humy, Vice-President in Charge of Engineering, Western Union Tel. Co.; W. C. Titley, Vice-President in Charge of Plant, Western Union Tel. Co.

The A.R.A. representatives on the E.E.I.-American Railway Association Joint General Committee are as follows:

R. H. Aishton, American Railway Association; L. A. Downs, Illinois Central R. R. Co.; A. C. Needles, Norfolk & Western Railway Co.; J. J. Pelley, The New York, New Haven & Hartford R. R.

For the carrying out of the work formerly carried on by the various Joint Engineering Subcommittees, Joint Development and Research Subcommittees, Joint Principles and Practices Subcommittees, etc., Joint Committees on Plant Coordination have been formed. The working committees, known as project committees, have not been changed as these committees were set up to carry out specific assignments. Their setup and assignments are subject to change from time to time by the Plant Coordination Committee as the work may require. The E.E.I. membership on the Plant Coordination Joint Committees is as follows:

*W. F. Davidson, *Chairman*, Director of Research, Brooklyn Edison Company; *A. E. Silver, Consulting Electrical Engineer, Electric Bond & Share Co.; J. H. Foote, Supervising Engineer, Commonwealth and Southern Corp.; T. H. Haines, Superintendent of Distribution, Boston Edison Company; Mark Eldredge, Chief Engineer, Memphis Power and Light Co.; M. D. Hooven, Assistant to Transmission and Substation Engineer, Public Service Electric and Gas Co.; J. O'R. Coleman, *Secretary*, Engineer, Edison Electric Institute.

The Bell System membership of the Joint E.E.I.-Bell System Plant Coordination Committee is as follows:

H. P. Charlesworth, *Chairman*, Assistant Chief Engineer, Am. Tel. and Tel. Co.; E. H. Colpitts, Vice-President, Bell Telephone Laboratories, Inc.; *O. B. Blackwell, Director of Transmission Development, Bell Telephone Laboratories, Inc.; *H. S. Warren, Director of Protection Development, Bell Telephone Laboratories, Inc.; H. S. Osborne, Transmission Engineer, Am. Tel. and Tel. Co.; L. G. Woodford, Plant Extension Engineer, Am. Tel. and Tel. Co.; H. L. Huber, *Secretary*, Engineer on Foreign Wire Relations, Am Tel. and Tel. Co.

The Western Union membership of the Joint E.E.I.-Western Union Plant Coordination Committee is as follows:

J. W. Milnor, *Chairman*, Research Engineer, Western Union Telegraph Co.; D. P. Dickie, *Secretary*, Assistant Engineer of Lines, Western Union Telegraph Co.; A. W. Donaldson, Plant Engineer, Western Union Telegraph Co.; H. W. Drake, Equipment Engineer, Western Union Telegraph Co.; J. C. Hubbard, General Supervisor of Lines, Western Union Telegraph Co.; L. M. Jones, Assistant to Research Engineer, Western Union Telegraph Co.

The activity with the American Railway Association has so far been limited to the preparation of Principles and Practices for inductive coordination. This work was carried on directly by the Engineering Subcommittee. At the request of the A.R.A. no modification has been made in their setup of this committee, and the A.R.A. members are as follows:

Sidney Withington, New York, New Haven & Hartford R. R.; H. S. Balliet, New York Central R. R.; H. A. Shepard, New York, New Haven & Hartford R. R.

The Plant Coordination Committee will function as the E.E.I. representatives on this committee in place of the former members of the Engineering Subcommittee.

*These four members are to constitute a Joint Subcommittee on Development and Research, of the E.E.I.-Bell System.

ARIEL DAM WITHSTANDS SEVERE FLOOD*

The Ariel Development of Inland Power & Light Company on the Lewis River in Washington withstood a severe flood in December, 1933. The flow over the spillway was estimated to have reached 120,000 to 130,000 cfs which is 20 to 30 per cent in excess of the discharge for which the spillway was designed. The following report was made by Mr. A. C. Clogher of Electric Bond and Share Company for the Committee:

"On Dec. 20 and 21, 1933, unusually large discharges were encountered in all of the streams of the west slope of the Cascade Mountains in Washington, because of excessive rains and a rather heavy accumulation of snow which had occurred earlier in the season. At the time that the Ariel plant was built the maximum flow of record was 60,000 cfs. The spillway was designed to discharge 100,000 cfs at an elevation of 50 ft above the crest of the spillway. The structure is a type which would suffer no major calamity were the water to rise high enough to spill over the crest of the arch dam.

"Data have not been collected with respect to other streams in adjacent territory so that it is impossible to make any statement concerning the percentage rise of the Lewis River above former recorded flows and similar data for other streams in the vicinity. During the flood, a natural lake upstream from the dam, created by a glacial moraine, overflowed the moraine to such an extent that it washed a gully through it and emptied the lake into the Lewis River in a comparatively short time. This happened on a small branch stream well up in the mountains where there were no observers present so that no estimate can be made regarding what effect the breaking out of this lake had on the stream flow.

"The flood is estimated to have reached its maximum some time after midnight of the morning of Dec. 21. It is estimated to have been between 120,000 and 130,000 cfs. At the time of the maximum discharge, the water reached an elevation 32.5 ft above the crest of the spillway.

"The powerhouse floor was designed to be high enough for protection against a flood of 100,000 cfs. This elevation was arrived at by a model test before the plant was constructed. The actual flood which occurred put the water about 1 ft above the transformer platform and powerhouse floor.

"A temporary protection could have been provided for the rise of the tail water level but the power plant was put out of service for an entirely different reason. Just downstream from the spillway was a single span steel highway bridge giving access to the plant. During the night of Dec. 20 and 21, this bridge disappeared probably by reason of the impact of the water undermining one of the abutments. The discharge from the spillway was so large that a portion of it was deflected up high enough to come down the highway running along the opposite bank from the bridge to the powerhouse, a distance of about 500 ft. The water ran down this roadway, tearing out the road bed and plugging the drains so that the powerhouse floor was flooded with muddy water, stopping operation of the plant before the rise of the tail water caused any difficulty. The water did not rise high enough to reach the main or auxiliary generators.

"The extraordinary discharges flowing over the spillway and dropping 180 ft did practically no damage to the plant itself. Service was interrupted by reason of the small stream of muddy water which flowed in onto the powerhouse floor and made it necessary to shut the unit down until the basement could be pumped out and the debris could be cleaned up."

*Submitted by Hydraulic Power Committee, EEI.

NEW ENGINEERING REPORTS

Price list of recent and earlier publications available upon request

EDISON ELECTRIC INSTITUTE
420 Lexington Ave., New York, N. Y.

SURVEY SHOWS ELECTRIC SERVICE AVAILABLE TO 89.2 PER CENT OF OREGON'S POPULATION

An unique survey recently completed by the Northwest Electric Light & Power Association shows that electric utility service is available to 89.2 per cent of the total population of the state of Oregon. This survey, which was conducted by Berkeley Snow, executive secretary of the Northwest Association, was undertaken to determine the extent to which utility service is now available to the population of that state, by what private companies and municipal enterprises that service is being furnished, and exactly what territories were being served by those companies.

The survey found 35 private companies, 10 municipal enterprises and two small federal power enterprises serving some portion of the state. The report of the survey tabulates populations served by each of these 47 enterprises and plots on a map the territory covered by each.

For purposes of compilation, the population statistics are divided into urban and rural. Urban population is considered to be that population residing within the corporate limits of incorporated cities and towns, and of this population so classified, the private companies serve 94 per cent and the governmental enterprises serve 5.6 per cent, so that it is shown that 99.6 per cent of such population in the state is receiving electric service. The small fraction of this classification of population not receiving service resides in 18 incorporated towns having populations ranging from 6 to 306.

All other population is classified as rural, and this includes suburban concentrations in the environs of incorporated cities but outside their boundaries, and the residents of unincorporated cities and dwellers in strictly rural territories. Of this rural population so classified, the survey finds the private companies serving 71½ per cent, the governmental enterprises 0.97 per cent, and the total of this group served is 72.4 per cent of the state's total rural population. Reaching this population the utility enterprises operate 2050 miles of high tension transmission and 5172 miles of distribution lines outside of the corporate limits of towns. These concentrations of population to whom service is available reside in an area equivalent to 8 per cent of the state's area. The fact that population in Oregon centers in such a comparatively small part of the state is explained in part by the fact that large areas in the central and southeastern portions of the state are ruggedly mountainous, heavily forested or comparatively unproductive agriculturally, and so have a very low population density. The federal lands in national forests, Indian reservations and national parks total 25 per cent of the state's area, and these comprise a large part of the areas of the state sustaining little population and hence in which little central station is available.

Annual Meeting Northwest Association

Leslie R. Coffin, vice-president, Puget Sound Power & Light Company, Seattle, was elected president of the Northwest Electric Light & Power Association at the Annual meeting of that body in Portland July 13. The meeting expressed hearty congratulations to the retiring president, L. T. Merwin, vice-president and general manager, Northwestern Electric Company, Portland, for bringing the Association so successfully through its first year of independent operation since the dissolution of the N.E.L.A.

Others officers elected were: Vice-president, K. M. Robinson, Idaho Power Company, Boise; State vice-president for Idaho, R. B. King, Idaho Power Company, Boise; for Montana, J. C. Ryan, The Montana Power Company, Butte; for Oregon, L. A. Grettum, Eastern Oregon Light & Power Company, Baker; for Utah, George M. Gadsby, Utah Power & Light Company, Salt Lake City; for Washington, Jeff L. Alexander, Puget Sound Power & Light Company, Seattle; members at large of the executive committee, J. E. E. Royer, The Washington Water Power Company, Spokane, and A .S. Moody, General Electric Company, Portland.

Mr. Coffin announced the following appointments: Chairman of the Accounting and Business Practice Section, R. E. Brennan, Portland General Electric Company, Portland; chairman of the Engineering and Operation Section, William S. Hill, Gray's Harbor Railway & Light Company, Aberdeen; and executive secretary, Berkeley Snow. The chairman of the Business Development Section and the treasurer are yet to be appointed.

On the same day as the Annual meeting, the new executive committee met and outlined plans for the coming year's activity. These plans contemplate the functioning of the three Sections along somewhat the same lines as these Sections functioned last year with committees reporting at an Annual meeting to be held during the Spring of 1935.

Usefulness of the Accountant

(*Continued from page* 272)

refers to the investment efficiency (dollars of fixed capital per dollar of revenue). The curves on the graph represent the operating efficiency (total expense to revenue ratio). The earnings on the fixed capital that will result from any combination of these efficiencies can be read on the vertical axis. For instance, in 1922 when the investment efficiency of $3 of fixed capital per dollar of revenue is superimposed along the 80 per cent curve representing the operating efficiency, the reading on the vertical axis will be 6.8 per cent which was the percentage earned on the fixed capital in that year. If it took four dollars of fixed capital to produce one dollar of revenue, with the same operating efficiency it can be seen at a glance that the earnings would be 5 per cent.

In many organizations, the duties of the accountant and the financial officer are centered in one man. Reiterating, he is in the most favorable position to indicate proper relationships between figures. In budgeting, he can analyze them to show their probable effect on trends, for, in the light of actual experience, he is the realist, and it should be his function to see that the estimates are sound and check up with the best performance of experience.

The profitable and successful management of a business is not accidental. Managers may not always be able to state the fundamentals and principles that have guided them, but a study of effects reveals causes. The accountant's contribution is to measure the changing forces and their direction, with understanding, so that the Company's future will be assured. As it is a man's usefulness to others that, above all other qualities, influences his success and the consequent success of his organization, it is the function of the accountant to have a real voice in establishing executive and corporate policy.

POWER SALES ITEMS

AIR CONDITIONING

"Purchased Refrigeration Conditions Specialty Store," by Paul Reed. Power, July, 1934, pp. 384-385. McGraw-Hill Publishing Company, 330 West Forty-second Street, New York City.

St Louis specialty store for women, air conditions entire store, four floors and basement totaling 40,000 sq. ft. with district refrigeration. Rewards are increased efficiency of sales staff, more and longer visits by customers, cleaner rooms, reduction in mark-downs due to fittings and exposure.

"Largest Freon Refrigerating Plant Air Conditions New Post Office." Power, July, 1934, pp. 392-394. McGraw-Hill Publishing Company, 330 West Forty-second Street, New York City.

Three compressors, totaling 1500 tons capacity, cool Washington's new Post Office Department Building. Liquid refrigerant is sprayed into water coolers by liquid pumps.

"An Air-Conditioned Street Car." Heating & Ventilating, June, 1934. The Industrial Press, 148 Lafayette Street, New York City.

The Chicago Surface Lines has recently placed in operation a new type of street car which has been, by streamlining and improvement in design, reduced approximately 8000 lb. in weight. Among the other features are indirect lighting, insulation of car wheels from the axle to minimize noise, and air conditioning. A motor-driven blower unit provides ventilation and an electric grid heater of 15 kw is used for heating this air in winter. Approximately 5 kw of this are under manual control while the remaining 10-kw unit is thermostatically operated. For winter operation, the blower will move 40,000 cu. ft. per hr. Air filtering is accomplished by passing the air through separate removable type filters which are thrown away when they become dirty. Air is under pressure inside the car at all times, thus keeping the interior clean.

"Motors and Lines Share Home 'Weather' Load Problem," by F. E. Sanford, W. R. Reise, Electrical World, May 19, 1934. McGraw-Hill Publishing Company, 330 West Forty-second Street, New York City.

Prospects of air conditioning loads are attractive, but the realities of rendering the service give rise to numerous operating problems, including light flicker caused by compressor starting. The solution by utility engineers is given.

DIESEL ENGINES

"Service Records of Diesel Plants," by Jay Samuel Hartt. Electrical World, June 30, 1934. McGraw-Hill Publishing Company, 330 West Forty-second Street, New York City.

The author of this article gives an analysis of 87 municipal utilities in Wisconsin, showing the number using diesel engines and other methods of generation or purchase of current. The article includes a curve which gives the comparison of cost of electricity between purchased power and diesel generation. Tabulations as to size, type, design and age of various prime movers of the municipal utilities are also interesting.

"Modern Advances in Diesel Engine Development," by C. B. Cramer. Southern Power Journal, July, 1934, pp. 24-26. W. R. C. Smith, publisher, Grant Building, Atlanta, Ga.

The purpose of the article is to thoroughly acquaint those considering some form of power equipment with the principles and applications of the diesel engine. The article touches briefly on some modern developments in diesel design; also over-all cost expectations.

ELECTRIC MOTORS

"How to Select the Motor for the Job," by George H. Hall. Electrical World, June 16, 1934. McGraw-Hill Publishing Company, 330 West Forty-second Street, New York City.

Those Power Sales Engineers that are requested to recommend motors for various industrial applications will find this article interesting and of some particular benefit. The article sets forth many of the modern motors available, their various uses and the applications for which they are best suited.

"Engineering Features in the Application of Thrusters," by J. A. Jackson. General Electric Review, June, 1934. General Electric Company, publishers, 1 River Road, Schenectady, N. Y.

This is a very complete discussion on the engineering features and possibilities for use of these machines. They are made in various sizes giving a straight line thrust of from 50 lb. up to 3200 lb. Comparatively small motors are used which are connected to an impeller which operates in a cylinder filled with oil. The thrust is obtained by the impeller building up an oil pressure which acts against the movable end of the cylinder causing a straight line motion of the movable portion. Various curves are given illustrating the characteristics of various sizes of these mechanisms. They are applicable in any class of lever motion where a straight line motion is desired such as controls on clutches for boring machines for the operation of clamping mechanism, various machinery manufacturing processes, brake duty, etc.

ELECTRIC SERVICE

"Consolidation of Electric Services at Tulane," by James M. Todd. Southern Power Journal, July, 1934. W. R. C. Smith, publisher, Grant Building, Atlanta, Ga.

A review of the details of consolidation of meters and services at Tulane University, so that all service might be purchased under wholesale rate schedule.

ELECTRIC WELDING

"X-Raying 400,000 Feet of Welding at Boulder Dam." Power Plant Engineering, July, 1934. Technical Publishing Company, Monadnock Block, 53 West Jackson Boulevard, Chicago, Ill.

In order to provide a non-destructive test on the electrically welded Boulder Dam conduits, an X-Ray testing method was devised. To test the enormous amount of welded sections X-Ray tubes of rated voltage of 325,000 are used. These rays penetrate the thickness of any plates used and will give a radiographic picture after a 20 second exposure. Wherever defects are found, weld material is cut out and fresh metal deposited, after which the area is again X-Rayed.

INDUSTRIAL ELECTRIFICATION

"Electrical Layouts for Production Economy," by W. S. Risser. Electrical World, June 23, 1934. McGraw-Hill Publishing Company, 330 West Forty-second Street, New York City.

Modern production changes with respect to factory assembly and use of electrically driven machine tools are herein discussed. The principles in question are applicable to many industrial production jobs.

ISOLATED PLANTS

"This Utility Bought a Private Plant—To Operate It," by Charles Benham, Jr. Electrical World, June 16, 1934. McGraw-Hill Publishing Company, 330 West Forty-second Street, New York City.

Here was an industrial station that had been serving its neighbors with steam and electricity for years. Unable to secure the electric business and irked by competition, this utility bought the facilities and continued the service profitably. So successful has been the move that other plants are now being considered for a similar approach. There may be many situations awaiting such a power sales policy.

LUBRICATION

"Correct Lubrication Means Dollars and Cents to the Textile Mill," by H. L. Marlow. Southern Power Journal, August, 1934. W. R. C. Smith, publisher, Grant Building, Atlanta, Ga.

Discussion of the lubrication of typical machine services in the textile mill, spindle, anti-friction bearings, electric motors. Intended to give the technical man in the plant a better understanding of what is required and what is available.

OIL CIRCUIT BREAKERS

"Three Ways to Insure Industrial Oil Circuit Breaker Adequacy," by R. I. Powers. Electrical World, June 23, 1934. McGraw-Hill Publishing Company, 330 West Forty-second Street, New York City.

The Power Sales Engineer in any average industry has to recommend to industrial users increased oil circuit breaker capacity due to additional load. The author gives three solutions to avoiding expensive oil circuit breaker replacements which could be directly applied in many industrial substations.

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Pub. No.		*Date Issued*	*Price to Members*	*Price to Non-Members*	*Price to Foreign Countries*
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Outdoor Meter Installations and Suggested Form of Housing for Outdoor Meters—*May, 1933, issue.*
Performance of Insulating Oils in Transformers—*May, 1933, issue.*
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Hydrogen Cooled and Outdoor Air Cooled Rotating Machinery—*September, 1933, issue.*
Foreign Practice on Arcing-Ground Suppressors—*September, 1933, issue.*
Foreign Practice on Insulating Oils in Transformers and Oil Circuit Breakers—*September, 1933, issue.*
1933 Progress Report on Operating Experience with Reclosing Circuit Breakers—*December, 1933, issue.*
U.R.C. Type Weatherproof Wire for Overhead Conductors—*January, 1934, issue.*
Electric Service for Oil and Gasoline Pipe Line Pumping—*February, 1934, issue.*
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Power Station Building Costs—*May, 1934, issue.*

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NEW E. E. I. REPORTS

STATION PIPING—1934

E.E.I. Pub. B5. A report of the Prime Movers Committee, Edison Electric Institute. 28 pages. Price 60 cents to members and their employees; $1.50 to non-members in the U. S. A.; $1.60 to foreign countries.

This report includes:

General statements on experiences with welded and general piping.

Development of bolting and piping materials.

Investigation of welded pipe joints for h-p, h-t service.

Experiences with h-p, h-t piping and valves at Delray No. 3, Trenton Channel, Deepwater (Houston, Texas,) and Edgewater stations.

Qualification tests for welders.

Manufacturers' statements covering welded and general piping practice.

OIL AND GAS ENGINES—1933-34

E.E.I. Pub. B7. A report of the Prime Movers Committee, Edison Electric Institute. 16 pages. Price 40 cents to members and their employees; $1.00 to non-members in the U. S. A.; $1.10 to foreign countries.

This report includes:

New Developments and Installations in the United States: typical units brought out during 1933; design and construction details; operating data on several large plants; new engine applications.

Accessories and Auxiliary Equipment: equipment and other items to be considered in designing a Diesel installation.

Important Considerations in Plant Design and Operation.

Water and Lubricating-Oil Cooling Systems: performance of several types.

Diesel Fuel Oil: progress in analyzing and specifying.

Operating Troubles: investigation and remedy of noise and smoke.

Trend of Operating Costs: elements tending to increase fuel and other costs.

Plant Operating Data: covering 52 engine units; maintenance costs; operating factors and outages.

Manufacturers' Statements.

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CONVENTIONS AND MEETINGS

AUGUST

24 Wisconsin Utilities Association, Transportation Section, Kenosha, Wis.

SEPTEMBER

5-7 Pennsylvania Electric Association, Bedford Springs, Pa.

10-11 Wisconsin Utilities Association, Commercial Group, Pfister Hotel, Milwaukee, Wis.

10-12 Rocky Mountain Electrical Association, Estes Park, Colo.

18-20 Association of Iron and Steel Engineers, Cleveland, Ohio.

19-29 National Electrical Exposition, Madison Square Garden, New York, N. Y.

OCTOBER

11-19 Economic Conference of Engineers, Stevens Institute of Technology, Johnsonburg, N. J.

29-31 American Gas Association, Auditorium, Atlantic City, N. J.

NOVEMBER

12-15 National Association of Railroad and Utilities Commissioners, Willard Hotel, Washington, D. C.

Dinner at Eighty

(Continued from page 278)

Maximum supplies are always carried, which explains how my kitchen is always ready to meet any demand which may be made upon it. I am sometimes asked how I deal with a sudden influx of passengers, which might mean a shortage of provisions, but such an emergency never arises. If it did we would just communicate with one of the depots, of which there are two more—one at Newcastle and the other at Leeds—besides those I mentioned at Edinburgh and Kings Cross.

Some of the food is prepared, or partly prepared, in the kitchens at these depots. For instance, the soup comes onto the train in great jars and only has to be heated. The pastry also has only to be warmed up on the train.

Every housewife will run her kitchen much more smoothly if she follows something of the same programme. Everything should be listed and checked regularly to see that no supply is ever allowed to run low. Do not consider it beneath your dignity as a cook to have plenty of tinned stuffs ready in case of an emergency.

Everything that can be prepared beforehand should be done at your leisure. Soups and sauces can very well be made in the morning and put away until you are ready to serve them. When you are cooking for a greater number of people than usual, you will find it a great help to have these finishing touches all ready prepared and to know that you have not to be bothered with them.

Much of my cooking is done in a large steam oven. This is also a very satisfactory manner of making the most of your cooking arrangements.

There is no end to the daintily served meals you will be thinking out yourself, when once you have seen to it that you have a well-thought-out electric kitchen.

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